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VIEWS, NEWS AND INTERVIEWS.

"Section 98 of the Tariff law puts a duty on 'carbons for electric lighting' of ninety cents a hundred,' said a customs appraiser to a reporter. "Before the passage of the Dingley law the standard length for carbons for electric lighting was 10 inches. The importers and the manufacturers of carbon saw the possibilities in the schedule, and carbon grew instantly from 10 inches in length to 40 inches. It looked for a time as if the government would have to take the loss; but Appraiser Wakeman decided that the growth of carbons was surely an evasion of the law and that a carbon 40 inches long was impracticable for electric lighting; that the intention of the importer was to cut or break them up into four carbons, and so he assessed each 40-inch carbon as four carbons. The Treasury Department sustained the ruling. But with lengths of oilcloth it is different. The law is distinct, and the manufacturers are entitled to every inch of benefit."

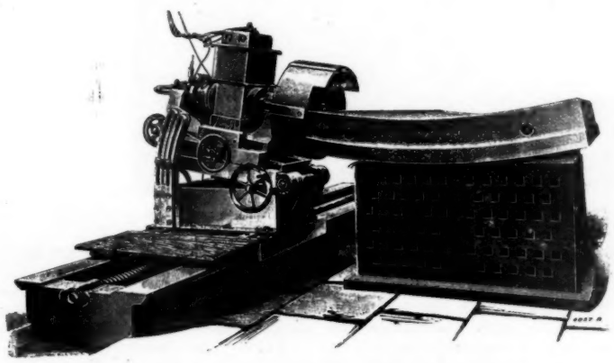
The operators at the Cross Mountain coal mines, in the Jellicoe regions of Tennessee, are preparing to put in electrical apparatus for mining coal.

An electric motor driving a cable railway is in operation in Kansas City, Mo., where, during the past Summer, the Walker Company installed a 1,500-kilowatt generator for the Metropolitan Street Railway Company. This machine now furnishes current to propel both electric and cable cars. To operate the cable machinery, an old 30-kilowatt General Electric generator was converted into a motor and belted to the driving machinery. In this way they were able to dispense with a 250-horse-power engine, formerly used to drive the 26,000 feet of cable. The experiment has proved so successful that other motors will be installed, and eventually the whole system will be transformed into an electric road. The first month after the change described above was made the operating expenses of this particular station were reduced 50 per cent, from $1,200 a month to about $600.

At Ostend the accumulator system has been adopted for tramway traction, each car being fitted with 12 cases of nine Laurent-Cély cells each, which have a capacity of 140 ampere hours, and can give a discharge of 50 amperes, says London *Engineering*. Charging takes from three-quarters to two hours. The cars weigh 7½ tons each, batteries excluded, and can accommodate 50 passengers. The motors, of which there are two to each car, are of 18-kilowatt capacity, and were supplied by the Westinghouse company. They drive the axles through gearing which reduces the axle speed to one-fifth that of the motor spindle. One charge of the battery is sufficient for a run of 44 miles. The tractive force is found to be 17.6 lb. per ton at starting, and 8.8 lb. per ton when running on the level at a speed of 11 miles per hour.

At the end of 1896 there were 916 electric roads in the United States and 30 in Canada, representing 12,133 and 450 miles of track, respectively. At the end of last October there were 953 electric roads and 13,765 miles of track in the United States, and 32 roads and 498 miles of track in Canada; figures which represent an increase of 13.4 per cent and 10.1 per cent respectively, in the total mileages of track. The mileage of cable lines in the United States has declined 10 per cent, from 599 to 540 miles; while the mileage of horse lines has decreased from 1,219 to 947, or as much as 22 per cent. There are now 29,659 motor cars on electric railways in the United States.

Here's a motorman suing for damages sustained in a collision with a tally-ho. In the Common Pleas Court at Cincinnati, on November 29, was filed a suit for $10,000 damages, alleged to be due Walter Ross, a motorman in the employ of the Cincinnati & Miami Valley Traction Company, by reason of injuries sustained by him in a collision between his car and a tally-ho on the afternoon of November 6. The defendants are well known society women. As the coach, driven by one of the ladies, started down a hill, a motor car in charge of Ross came up behind. In response to the alarm bell on the car the tally-ho was driven out of the car tracks, and then directly back on again. A collision resulted. Ross stuck to his post, and managed to reduce the speed of his car, thereby saving from possible serious injury the 50 women and children who were passengers. Three of his ribs were broken. The tally-ho occupants escaped severe injury, although one of them was knocked senseless and lay unconscious for hours.



An Electrically Driven Grinder for Finishing Armor Plates.

An Electrically Driven Grinder for Finishing Armor Plates.

At Vickers's Works, in Sheffield, England, large quantities of armor plates are manufactured. One of the most important steps in the process is, of course, hardening the face of the plate. An effect of this hardening of the face is to preclude the possibility of machining it; and the depth effected is one inch to one and one-half inch, and any further adjustment, usually on the edges, is done by electrical grinding machines, one of which is shown in the accompanying illustration, taken from London *Engineering*. The stones are in segments, secured in a cast-iron disk, the spindle attached to which is coupled direct to the armature of an electric motor of about 30 effective horse-power, running at 400 revolutions per minute. The whole is so mounted that it can be tilted to any angle required for the bevel edges of the plates. The levers for controlling the swivelling are placed at the side, as shown in the engraving, where also a platform is provided. There are adjustments in four directions: 1. Swivelling about the axis of the saddle horizontally. 2. Vertically about the hinge in the front of the saddle. 3. Longitudinally along the bed-plate, and at right angles to the bed-plate. The first movement is accomplished by worm and segment, the second by worm gear, spurwheels, and spur segments, each independently driven by motors. The longitudinal traverse along the bed-plate is by a screw actuated by a belt and pulley driven from the line shaft of the shop.

Catalogues Wanted.

The Ramsdell Electric Construction Company, 102 Harbor street, Salem, Mass., state that they would like to receive catalogues of electrical and telephone supplies from advertisers in the Electrical Review.

The Portage, Wis., electric light plant will be increased by a dynamo with a capacity of 2,000 16-candle-power lights.

ELECTRICAL INCIDENTS AND RUMORS.

TALKS WITH SEVERAL WELL KNOWN ELECTRICAL GENTLEMEN, AND A GLANCE OVER THE FIELD.

There are a number of changes and rumors of changes going on in the electrical field, chiefly relating to alliances on the part of large manufacturing companies. What these amount to the next sixty days will probably show.

The pooling of the interests of the rubber-covered wire manufacturers is far from an accomplished fact, but has certainly not yet been abandoned. The difficulty seems to be to harmonize all interests so they can get together in one company and accept stock of the new company in return for the property and business they turn in. It is a case where a little cold, hard cash, or rather a good deal of it, would make a material difference if expended in buying up the smaller manufacturers of insulated wire.

The field of general manufacture occupied by such companies as the General Electric, Westinghouse, Walker, Fort Wayne, Stanley, Siemens, Western Electric, etc., provides a well flowing fountain of rumors of combinations and combats. The suggested union of the Walker Company and the Fort Wayne, now that Mr. Anthony N. Brady has become one of the controlling men in the former company, is looked upon as quite likely. Mr. R. T. McDonald, of the Fort Wayne company, is said to be closely allied with Mr. Brady.

In an interview with Mr. McDonald last week, he made the following statement to a representative of the ELECTRICAL REVIEW:

"No action has been taken looking to the consolidation of the Fort Wayne company with any other company. We are very busy, running full force in all our factories. In fact, we shall soon have to enlarge. Concerning the Walker Company, they have a good organization for turning out big work, and a union between that company and the Fort Wayne might prove advantageous. Both factories would probably continue. However, no consolidation has been made, and whether there will be or not, I am not prepared to state."

Before leaving Mr. McDonald, he called attention to the inclosed arc lamp which was on exhibition in his New York offices, and which is meeting with a very large sale.

Rumors have been current for some weeks past the burden of which were that a pool had been formed in the arc lighting field, that is, for the new form of inclosed arcs which has in the last two years almost entirely replaced the other forms for arc lighting. The idea current was that it was a pooling of patents involving the Electric Arc Light Company, of which system Prof. L. B. Marks is inventor, the General Incandescent Arc Light Company, the Puritan Electric Company, makers of the Puritan alternating inclosed arc lamp and the Manhattan General Construction Company, which until within a few months has been the agent for the inclosed lamp known as the "Manhattan," now made and sold by the Jandus Electric Company, of Cleveland. Mr. S. Marsh Young, president of the Manhattan General Construction Company, who has been credited as the active promoter of the pool, was interviewed in his offices in the Bowling Green Building. In answer to a question from the representative of the ELECTRICAL REVIEW as to the existence of the organization or pool, he said:

"No such arrangement has been entered into by those companies and nothing which involves a consolidation of patent matters nor anything approaching that nature has been consummated. It is a fact that a number of the companies manufacturing inclosed arc lamps have opened offices in this building, but it has no particular significance."

"Will you kindly state the attitude of these companies at the present time?" said the REVIEW representative.

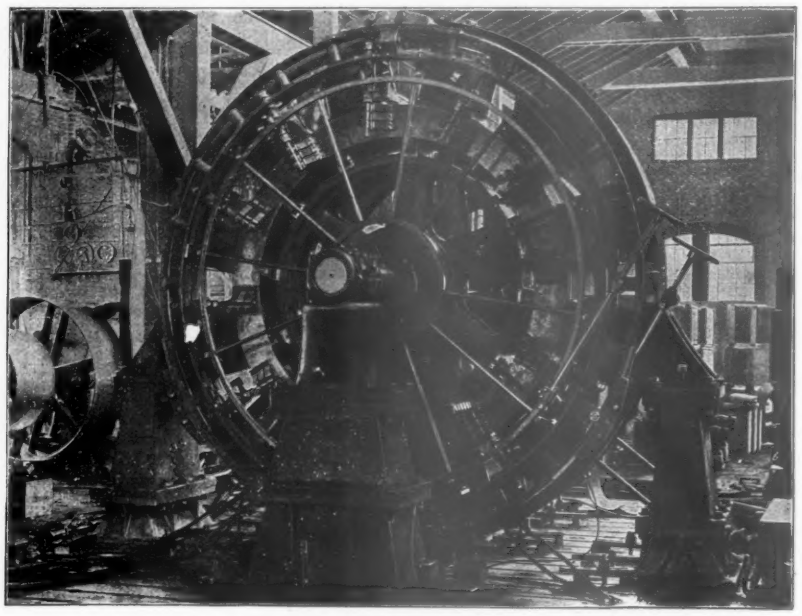
"The Manhattan General Construction Company, during the past five years, has installed 15,000 lamps. After two years of careful study, I came to the conclusion that the company manufacturing the 'Pioneer' lamps under the Marks patent was very strongly intrenched as to the patent situation, so much so that I consider it to be an even thing as to the maintenance of my position, and, as an expedient in the insurance of the lamps which I had installed, I recently arranged for the Manhattan General Construction Company to act as a licensee, paying the company known as the Marks Electric Company a royalty, thus insuring protection to the lamps already sold, and also in future being protected by the 'Marks' patents. The Electric Arc Light Company, the General Incandescent Arc Light Company and the Puritan Electric Company are in the same attitude as the Manhattan General Construction Company, as licensees of the Marks Electric Company. The Marks Electric Company was recently organized merely to hold the Marks and other patents which had been possessed by the Electric Arc Light Company, and in future that company is merely a licensee. The patents involve the broad, fundamental claim for drawing an arc through an inclosed globe."

Besides the companies named, there are a number of others engaged in the manufacture of inclosed arc lamps, notably, the Diehl, Jandus, Fort Wayne, General Electric, Standard Thermometer and Electric, Walker, Helios, etc.

Among the visitors to New York city last week was Mr. Henry Hine, the well known general manager of the Stanley Electric Manufacturing Company, Pittsfield, Mass. Mr. Hine, who made his headquarters at the Waldorf-Astoria, had run down from the Berkshire Hills to close up a big southern contract, and when seen by the ELECTRICAL REVIEW representative had the papers signed in his inside pocket. The Stanley Company is one of the busiest electrical manufacturing companies in the United States, and is enjoying the satisfaction of getting good prices and turning out work of the highest grade. Mr. Hine said:

"I am convinced that the electrical business is going to take on wonderful strides during 1898. We are so busy now that we hardly know which way to turn, and in some cases are compelled to decline to bid. The outlook is certainly very bright."

There is renewed talk in well-informed electrical circles over the probabilities of a severance of the friendly patent relations existing for some time past between the General Electric and Westinghouse companies. It is not likely, however, that the patent litigation of former years will ever be resumed.



M. P. 12-400-120 GENERATOR, WITH SMOOTH-BODY ARMATURE.

FORM OF THE CATHODE STREAM.

BY WILLIAM ROLLINS.

If it should be proved that with a concave cathode the focus of the stream varied in distance from the surface (with the degree of vacuum), then the following suggestion might be of interest:

If the stream is formed because the molecules having the same charge as the cathode are repelled by it, they ought also, having the same charge, to repel each other. If the cathode is circular and its surface a plane, the molecules leaving this perpendicular to its surface and moving in straight lines should form a cylinder if they did not mutually repel each other. If they repel each other the cylinder should widen out. If the surface of the cathode is concave with a spherical curvature they should come to a focus at the center of curvature if not influenced by mutual repulsion. If they tend to repel each other they should come to a focus beyond this. If the vacuum increases, the potential required to drive the stream rises. This will be accompanied by a stronger repulsion among the molecules and between them and the cathode as well as by a diminished lateral resistance from the molecules of residual gas. As a result the focus should be farther away from the surface of the cathode.

A Smooth-Body Generator.

An addition to the lighting portion of the station of the Edison Electric Illuminating Company of Paterson, N. J., will shortly be made in the shape of two 200-kilowatt, 10-pole, 150-revolution, smooth-body General Electric lighting generators. These will furnish current to their already extensive three-wire system, and, when installed, will give to the Paterson company a total generating capacity for lighting purposes of 1,400 kilowatts in direct connected apparatus of the General Electric smooth-body type. The feature of these machines, which has given them their name, lies in the armature, which is built up of a laminated, soft steel core without teeth, having the coils in the shape of rod or pressed stranded conductors connected by end bars forming the surface of the commutator which is on the vertical face of the armature and has, of course, as many segments as the armature has coils. The adoption of this method of construction saves losses due to resistance in commutator loads and segments, and is of importance in generators of low-potential with large current output. The large number of segments reduces the volts per bar to a minimum, and renders them absolutely sparkless while the vertical commutator permits of the inspection of all the brushes at once. The brush-holders are so arranged that by one hand-wheel they may be simultaneously shifted, or by another all raised at one time from the face of the commutator. Our illustration shows one of these smooth-body generators in process of construction in the works of the General Electric Company at Schenectady.

HOW TO BECOME AN ELECTRICAL ENGINEER.*

BY GEORGE B. LAUDER.

If the young man asking advice is able, from a financial point of view, to study electrical engineering in some of the reputable schools or colleges in this or other countries, he should do so as the quickest and best means of getting much of the required knowledge. At the same time he should make it a point to become as familiar as possible with the practical applications of electricity, previous to commencing the study and during the vacations, as, by so doing, one is able, from the practical experience so gained, to more easily understand the theory. Practical training may be gained by working with some electrical construction firm or in some electric light or power station. Any further advice in a general way would seem unnecessary, for there would be but the one sensible course to be pursued by such a young man.

Presupposing that the seeker for advice is 18 years old, has had a common school education, but is unable, from the lack of the necessary money, to prepare for and take a course in electrical engineering, the writer, acting both on practical experience and from observation, would submit the following advice.

Starting with the above conditions, it will be possible for a determined young man to become an electrical engineer at the age of 30, though not much, if any, before, for the 12 years are none too many in which to prepare. To be sure, as many have done, one might, after two or three years' experience as a wireman, hang out his shingle: "Mr. So-and-so, Electrical Engineer;" but the ability of such a one would exist solely in his own imagination or through the ignorance of those with whom he came in contact. Our young man must not only work hard during the day, and do it every day, but, together with that, he must devote most of his evenings and other spare time to studying books, and in that way get the benefit of the work and knowledge of those who were before him. There is no other way, and unless that is done faithfully and continually, success as an electrical engineer is impossible.

The first step is to go to work for some concern which does wiring for electric lighting, and learn how to wire houses, etc., not with an idea of becoming an expert wireman, but because, by so doing, one can obtain, probably as quickly as possible, some conception of one or two of the first principles of electrical science. Two years should be enough in the wiring business, and it would be well to drop it at the end of that time. During these two years some conception of "volts," "amperes" and "Ohm's law" should be forming in the young man's mind, and he would be learning his needs in regard to reading matter. It would early be advisable to send to the ELECTRICAL REVIEW for a catalogue of their publications on electrical and kindred subjects, to select a few of the simplest works on electricity and to try and read them understandingly. A thing should not always be taken for granted simply because some book states that it is so; one should satisfy oneself that it is so and why it is so, for then one is reading intelligently and to one's great profit. It is very probable that our reader will find himself floundering before progressing very far in his study, certainly a little later. When he does he has, even thus early, arrived at one of the critical points in his undertaking, and, as he then does or does not, so will he meet success or failure in the future. If he would be successful he must, when he finds he is not reading understandingly, learn the reason why and at once begin another line of reading and study which will lead up to and make clear the misunderstood matter; and, if he will do so faithfully and in every instance, he will be successfully fighting for the honest name of electrical engineer.

Now, having spent two years as a wireman, and in starting his line of book study, our young man is 20 years old and ready for the next step, which should be to get in with some electric lighting or power company in some small city of from 15,000 to 25,000 inhabitants, and go to work in the station (a station using steam-power would be necessary now or later), and in that way open an acquaintance with other principles of the science. A wise young man will not hesitate to keep himself in the best standing with his fellow-workmen, to act the part of a man willing to work, and at all times to bear in mind that he can learn something from others. Here he will have opportunity to become familiar with dynamos and other apparatus, to trace out connections on switchboards and elsewhere, to learn how to repair arc lamps, meters, etc., and will unconsciously become familiar with certain principles, and be constantly opening up new fields for thought and study. Steam engines and boilers should be considered, and our young man should begin to read the very simplest works on steam engineering, and to advance in such reading as fast as it may be done understandingly, but no faster. It will early become evident that a systematic and thorough study of mathematics is absolutely a necessity, and, as time goes on, the study of mathematics must continue.

The question of saving money must be constantly kept in mind, and at the very start a method of saving—as much as may be done without bodily discomfort or loss of health for want of proper care—should be adopted and adhered to during all of the 12 years, for, if the lines herein suggested are followed, the money will be needed by and by.

The writer would advise the young man to stay with the electric company, either with the same or different ones as opportunities present themselves, until he is 24 years old, and during that time to continue his work, study and money saving on the same general lines as have already been laid down. At the age of 24 he should be ready, and it would be advisable for him, to take a special course in some one of the best scientific colleges in this country, covering two years in time, and in so doing to make it a point to get a knowledge of the fundamental principles of chemistry, an insight into the higher mathematics, some training in mechanical drawing and some knowledge of mechanical engineering, and as much knowledge of theoretical electricity as can be obtained in that time. Of course three years would be better than two, but more than three would not seem best at this age. Advice regarding the individual studies to be taken up would be out of place here, for our young man at twenty-four would know himself about what he needed.

The question of money with which to pay tuition and the expenses of a special course is liable to be a serious one, as quite likely it will have been impossible to have saved enough for the purpose. There are, however, a number of things which may be done. Perhaps a friend or relative may be found who will advance the amount necessary; it is practicable to take out a policy in some life insurance company and borrow the money with the policy as security; one might be fortunate enough to obtain a free scholarship and thus save the bulk of the expense. There will be found, as a rule, some way of getting the money needed, but, if not, the course must be taken at a later time. After completing the special course the young man could do himself much benefit by spending a year or two in some modern machine shop, to learn the construction and operation of machinery in general, to look into designing, if possible, and at all times to continue reading up in mechanics, steam and electricity.

The remainder of the time could be well spent in one of the larger electrical manufacturing companies in the country.

The writer knows two young men, neither of whom is 30, who have lived much after the ideas set forth in this communication, and who are rapidly approaching the time when they can truthfully style themselves electrical engineers.

Our young man will not have much time for reading novels, but, nevertheless, the writer would recommend two which might be read at any time during the first year or two; one, "Zachary Phipps," by Edwin Lassetter Bynner; the other, "The Honorable Peter Stirling," by Paul Leicester Ford, the reader to draw his own conclusions.

It is almost unnecessary to add that the young man should, in common with us all, be a constant and diligent reader of the ELECTRICAL REVIEW.

*See editorial on page 276.

ELECTRIC RAILWAY NOTES.

The Norfolk Southern Street Railway Company has been incorporated under the Massachusetts laws, with a capital of $150,000. The board of directors is John C. Lane, of Norwood; Robert S. Gray, Joseph J. Feeley, of Walpole; Edward F. Draper, of Boston; George S. Forbush, of Brookline; Frederick S. Lane, of Foxboro; Aaron R. Sanderson, of Boston. The road will run 17 miles, starting at the junction of Washington street and Railroad avenue in Norwood, and extending through Walpole and Foxboro to the railroad station in Mansfield.

The Franklin & Megantic, Me., Railroad, with all its equipment, has been sold. The road has been operated since last September by the first bondholders, who have formed a new corporation, styled the Franklin & Megantic Railway Company. Under the new management the road will be greatly improved. Its officers are J. S. Maxy and P. H. Winslow, of Gardiner; H. F. Horton, of Providence, R. I., and L. C. Cornish, of Augusta.

The annual reports of the Massachusetts street railway companies to the railroad commissioners for the year ending Sept. 30, 1897, have been filed. Among the more important are the following:

Wakefield & Stoneham: Gross earnings, $58,225; expenses, $34,961; net earnings, $23,263; charges, $13,630; balance, $9,633; dividends, $7,500; surplus, $2,133; total surplus, $4,012.

Quincy & Boston: Gross earnings, $118,394; expenses, $79,112; net earnings, $39,282; charges, $6,207; balance, $33,074; dividends, $28,448; surplus, $4,626; total surplus, $38,778.

Newton: Gross earnings, $94,071; expenses, $67,649; net earnings, $26,422; balance, $16,833; dividends, $16,800; surplus, $33; total surplus, $20,861.

Newton & Boston: Gross earnings, $44,542; expenses, $26,292; net earnings, $18,249; charges, $9,497; balance, $8,752; dividends, $4,687; surplus, $4,065; total surplus, $6,497.

Globe: Gross earnings, $312,035; expenses, $211,509; net earnings, $100,534; charges, $79,212; balance, $21,323; dividends, $13,000; surplus, $8,323; total surplus, $17,646.

Gloucester, Essex & Beverly: Gross earnings, $58,641; expenses, $37,493; net earnings, $21,147; charges, $11,816; balance, $9,331; dividends, $5,000; surplus, $4,331; total surplus, $1,548.

Gloucester: Gross earnings, $66,398; expenses, $38,633; net earnings, $27,764; charges, $11,329; balance, $16,435; dividends, $10,800; surplus, $5,635; total surplus, $23,089.

Lowell, Lawrence & Haverhill: Gross earnings, $426,656; expenses, $238,380; net earnings, $188,276; charges, $104,548; balance, $83,727; dividends, $30,000; surplus, $53,727; total surplus, $100,340.

Lynn & Boston: Gross earnings, $1,425,210; expenses, $818,626; net earnings, $606,584; charges, 509,620; balance, $103,689; dividends, $99,472; surplus, $4,217; total surplus, $91,149.

Brockton: Gross earnings, $332,256; expenses, $207,155; net earnings, $125,101; charges, $68,362; balance, $56,738; dividends, $36,760; surplus, $20,978; total surplus, $42,816.

CONCERNING THE ACTION OF X RAYS ON CULTIVATIONS OF TUBERCLE BACILLUS.*

BY FRANCIS POTT, M. D. BRUX.

The treatment of pulmonary tuberculosis in man by means of X rays has been described by several experimentalists. In the cases thus treated, improvement in the state of the patient was ascribed to the curative agency of the X rays, but no sufficient proof of this action has been given, nor is there any indication of the manner in which the rays affect either the tubercle bacilli or the surrounding tissues. The experiments detailed below were undertaken with a view to ascertaining whether X rays inhibit the growth of or kill the tubercle bacillus. Preliminary experiments with X rays and glass test-tubes showed that different makes of glass were opaque to X rays in very different degrees. Soda-glass test-tubes, with sensitive paper beneath them, were exposed to X rays of the same intensity as those used in the subsequent experiments. Objects such as pins, keys and chains were placed inside and underneath the test-tubes. The resulting skiagrams gave perfect pictures of those objects opaque to the rays which were inside and underneath the test-tubes, whilst the soda-glass test-tubes themselves were but faintly outlined at those points where the X rays had had to pass through the greatest thickness of glass. The slight resistance offered to X rays by thin soda-class test-tubes was not considered to be sufficient to mar the value of the inference drawn from the following experiments.

Into 25 sterilized test-tubes glycerine agar-agar peptone was run, and allowed to solidify in the position used for streak culture, so as to give a large, flat surface. On April 21, 1897, the agar in the tubes was sown with tubercle bacilli, taken from a cultivation belonging to Dr. Arthur Ransome, which had been obtained from University College Hospital and been shown to be pure and vigorous. The laboratory work was carried out by Mr. F. J. Tanner, at Bournemouth. The 25 inoculated test-tubes were incubated at 37 degrees centigrade for a month. By this time characteristic colonies of tubercle bacillus had developed in each of the tubes, either as films, small colonies or heaped-up masses. No growths other than tubercle appeared in the agar. The test-tubes were divided into sets of three and one set of four, numbered and lettered. One tube from each set was reserved as a "control," the remaining 17 being exposed to the X-rays. To insure an equal distribution of X rays over each inoculated surface of agar, the test-tubes were laid flat upon a horizontal rotary table with their closed ends converging to the center of the table. This arrangement placed all the test-tubes well within the focal area of the Crookes tube which hung above them, whilst it allowed the table and its load to be shifted around from time to time. Beneath the rotary table there was a space for the admission of a sensitive plate. To demonstrate that the X-ray apparatus was working well at any moment during the lengthy exposure, a sensitive plate was slipped into its place, exposed and developed at once, producing a picture of the pins and metallic trifles which had been scattered amongst the test-tubes. The apparatus used for producing the X rays consisted of an induction coil giving a five-inch spark, a 10-volt accumulator and several Crookes tubes of modern pattern. These tubes were occasionally interchanged to rest them. At the suggestion of Mr. Howlett, of Hull, damped wool was successfully used on the vacuum tubes to prevent sparking.

On May 23, 1897, the 17 test tubes containing the cultivations of tubercle bacilli were exposed to the X rays. The series of cultivations received exposures varying from one-half hour to 11 hours. Two tubes were withdrawn from the area of the X rays at intervals of one-half hour, one, two, four, six, eight and 10 hours, the remaining three tubes receiving the full exposure of 11 hours. During these 11 hours the control cultivations were taken out of the incubator and placed in a protected place at ordinary room temperature, similar to that in which the experiments were carried out. At the conclusion of the experiments the whole number of cultivations was returned to the incubator.

During the first week of September, 1897, the cultivations were examined, a period of over three months having elapsed since they were exposed to the X rays. All the colonies of tubercle bacillus were found to be thriving. Differences in the rate of growth of the colonies were perceptible, both in those which had been exposed to the X rays and those which had been used as controls. These differences were only such as are usual in a series of agar cultivations of tubercle bacillus. In tube No. 16, which had been exposed to the rays for eight hours, the activity of the growth was remarkable, the colony of tubercle bacillus taking the shape of an acuminated corrugated mound with a base area somewhat larger than a threepenny piece. From this largest growth the colonies graduated downwards in size to that of a pin's head. The development of the colonies during the three months between the exposures and the final examinations was in accord with that of any large series of tubercle bacillus cultivations.

A comparison of the colonies exposed to the X rays with those used as controls showed no variation in color, size or manner of development which could be attributed to the different treatments which the colonies had undergone. These experiments point to the conclusion that X rays do not affect the tubercle bacillus, and lead us to believe that the improved condition of tuberculous patients who have been submitted to the influence of X rays was due to causes other than the action of the rays.

*From the London *Lancet*.

The Rapid Transit Situation In Boston.*

About the only topic discussed in State street the past week has been the most unexpected decision of the Massachusetts Railroad Commission respecting the lease of the West End to the Boston Elevated.

In more ways than one the decision of the railroad commissioners is the most important ever given by this or any other Massachusetts commission. It covers 11 printed pages of the style used by the Massachusetts railroad reports, and scores against the lease from beginning to end in almost every possible aspect. The remarkable fact remains, however, that out of a population of 2,500,000 in Massachusetts, no other three men can be found who would have written such a decision. The Massachusetts commission has usually been the "guide, philosopher and friend" to transportation interests in this state. Here was the largest measure of transportation interest upon which the state of Massachusetts was ever called upon to pass.

It was fought through a stockholders' contest where certain large interests declared as owners of the property: "You can not afford to build this elevated road." It was fought through the legislature that said: "You must put up $300,000 forfeit money to show that you will build it." It passed the Governor, who said: "This must be a clean-handed measure." It raised the required capital, got the railroad commissioners' permission to issue $500,000 for preliminary expenses, secured agreement for lease of the West End, and then fought off New York objectors in the court.

Nobody dreamed that the railroad commissioners would kick the whole matter into the street. It was believed that at the worst they might have some technical objection, some slight impairment of capital to be adjusted or some counsel to give. But they gave the whole enterprise a lightning stroke as from a clear sky.

The commissioners gave a public hearing upon the lease question, and the only remonstrant who appeared against the lease abused the commission because it had permitted the West End to conceal millions of earnings and fatten the property, and now the elevated was to take all this fattened property and jeopardize it by such payments for taxes and other public assessments that the lease ought not to be confirmed.

After this hearing the railroad commissioners conclude that the West End has no concealed earning capacity, is worth somewhat less than it is already capitalized for, and that so far as the "due and safe transportation of the public" is concerned, the public can walk before the commission will approve of any such lease.

We believe the Massachusetts railroad commission was not created as a block to enterprise or progress. When Henry M. Whitney, Boston's most enterprising merchant, purchased all the companies now comprising the West End Street Railroad Company for $11,000,000 cash, the capitalization was only about $6,000,000 and the recent selling price between $7,000,000 and $8,000,000. Mr. Whitney shouldered this burden of $11,000,000 and attempted to straighten out the Boston street railway tangle, for small cars with horses were blocking the main thoroughfares.

The railroad commission refused to allow a capitalization for a large part of the purchase price, and Mr. Whitney's syndicate had to pocket the loss on this account of more than $1,000,000.

Mr. Whitney had to fight with the Massachusetts railroad commission continually to get permission for his new stock and bond issues, and, although standing by the letter of the law, the commissioners privately admitted that they had to nurse the concern, because new capital must be created before the old capital could be charged off.

The present railroad commission, however, says nothing of enterprise, the burden laid upon new capital or the public necessity for rapid transit. It speaks as a graven image, and crowns the labors of the public, the legislature, the property-owners and the men of enterprise, capital and brains with a blow, the result of which it is too early to foresee. Had the commission demanded some concession, or found a public sentiment at its hearing appealing for protection, or found objections which had been overlooked or had not been previously considered by the legislative branch of the government, there would be a different feeling toward the commission from that which is now growing in financial circles.

Many issues may arise from this decision. The first issue will be: Is rapid transit for the city of Boston to be downed by this decision of the state commission? If it is not, all may go well; but if it is, two other issues will arise: First, Is Massachusetts driving capital from her borders? and, second, can government by commission in Massachusetts stand the legal trial which has several times previously been threatened?

The common sense logic of the situation would appear to be that if capitalists could be found willing to put $10,000,000 to $20,000,000 of fresh money into the construction of steel bridges through Boston streets, to carry present street traffic at an elevation, certainly the West End Street Railway common is worth the eight per cent dividends it is now receiving; otherwise capitalists would not be willing to bank $10,000,000 to $15,000,000 upon it and the future growth of the transportation interests.

The chances of securing capital to settle the rapid transit problem in Boston are now very much diminished.

In a dissertation, covering legal technicalities where it does not treat with that which has already been considered by the legislature, the Massachusetts Railroad Commission has unwittingly struck a body blow at the whole structure, where it was called upon to see only that the roof was waterproof.

*From the *Boston News Bureau*.

A CARBON DETECTOR OR RECEIVER FOR HERTZ WAVES.*

BY FREDERICK J. JERVIS-SMITH, F.R.S.

Detectors of the Hertz electro-magnetic oscillation (such as those of M. E. Branly, *Comptes Rendus*, 785, 1890) consist of small tubes partly filled with metallic filings, furnished with pole pieces in contact with the filings. M. E. Branly, in his excellent paper, makes no mention of having tried carbon as a Hertz wave receiver. I find that receivers having carbon contacts have been spoken of as useless. Prof. Oliver Lodge in his book—"The Work of Hertz"—mentions in a footnote (page 30) that Professor Fitzgerald has succeeded with carbon, but no references are given to experiments on the point.

Thinking it possible that the smallness of the particles of carbon might affect the result, and that powdered carbon might not act in the same way as an ordinary carbon microphone which had been tried, I reduced some electric lamp carbon to the finest powder, and placed it in a thin glass tube furnished with terminals; the detector I thus made was placed in a circuit, including a dead-beat galvanometer (resistance 50 ohms), one dry cell electromotive force, 1.4 volt, and about 8,000 ohms added resistance.

When the circuit was closed, the carbon receiver having been previously tapped or gently shaken with a vibrating fork, the galvanometer indicated that a small current was flowing in the circuit. The carbon detector was exceedingly sensitive to the slightest electrical disturbance. To get the best result the resistance of the carbon receiver should be such that a small current can flow through it. This condition is easily obtained by furnishing the carbon receiver with pointed terminals, which can be screwed to any required depth into the powdered carbon. On trying to set up the same conditions with a detector containing metallic filings (nickel, iron, copper, silver), difficulty was experienced in so adjusting the terminals that a small current should flow, but with carbon the difficulty entirely vanishes.

The carbon receiver proved itself to be a most interesting instrument. During a thunderstorm which took place within a few miles of Oxford on July 27, the galvanometer indicated that each flash slightly reduced the resistance of the carbon receiver, and the spot of light was shifted by successive jerks in the same direction till quite off the scale; the night being still, the gradually approaching storm could be well observed.

After the movement of the spot of light the time was taken with a stop chronograph watch, and after 50 seconds the thunder could just be heard, the lapse of time indicating a distance of over 10 miles. During 40 minutes, the time between the indication of the carbon detector and hearing the thunder changed to 10 seconds, which was the minimum time.

Some detectors similar in dimensions, but made so that they could be exhausted, were tried at the same time. the different detectors being thrown into the circuit by means of a switchboard; the vacuum does not appear to improve the action. The tubes were carefully made by the late Mr. E. Cetti, and exhausted in November, 1896. From these, and many other experiments, I believe that carbon, instead of being a useless substance as a detector of Hertz waves, will be found (when in fine powder) to be both reliable and certain in its action.

During the storm I have spoken of, the apparatus was placed on a table in a room, the door and windows of which were closed. The instrument was not in connection either with the earth (except in as far as it rested on a deal table), or with any conductor extending into the air outside the house.

I have fixed a mast to the roof of the house, so that a conductor may be easily hauled up it; when the detector is connected to this and also to the earth, atmospheric electricity interferes considerably with telegraphy with a Branly or my powder carbon detector.

* From the London *Electrician*.

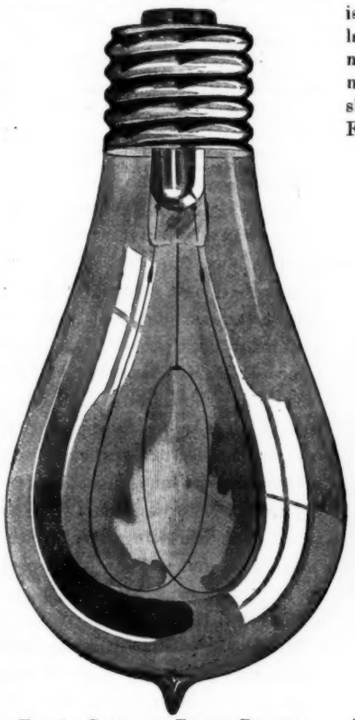


FIG. 1.—STANDARD EDISON RAILWAY LAMP, EXACT SIZE.

FIG. 2.—ROUND BULB EDISON RAILWAY LAMP, EXACT SIZE.

Improvements are about to be made by the People's Electric Light and Power Company, of Newark, N. J., that will cost something like $200,000. Work has recently been begun on the construction of a new power-house in River street to replace the one that was partially destroyed by fire last Winter. The dimensions will be 75 by 110 feet, which are a few feet larger than those of the old building. The company hopes, by the improved arrangement of the building and improvements in the machinery, to have a capacity four times that of the old plant. The incandescent plant alone will at once be increased from 1,700 horse-power to 3,000, and ultimately to 12,000.

Street Car Lamps.

The important feature in lamps intended for use on railway circuits is long life without decrease in brilliancy. To secure this, both mechanical strength and uniformity of product are essential Railway lamps should be uniform, not only in size, shape and appearance, but absolutely so in current consumption. Both length of life and sustained candle-power depend upon such uniformity, and while the former is the most desirable characteristic, it should not be forgotten that lamps are primarily made to give light. Practically any length of life can be secured in lamps of low efficiency—lamps consuming a large amount of power; but power is not had for nothing, and while one lamp may last longer than another, it may consume so much current as to make it cost more than a lamp of shorter life consuming less current. Furthermore, a lamp may have a very long life, and yet be so dim as to make it worthless—consuming current without giving a proper return in life. The ideal lamp, therefore, is that in which the average life is combined with average candle-power and energy consumed to give the best lighting service for the least cost, including lamp renewals and power consumed.

In the Edison railway incandescent lamp the results above are claimed, first by its mechanical strength, the filament, of cellulose with a hard graphitic carbon coating, being so shaped and anchored as to protect it, as well as the bulb, from injuries likely to occur from the vibration and shock inseparable from street-car service. The anchoring of the filament is essential. An unanchored filament must necessarily be so stiff and short as to limit the light to a small area. This reduces both the efficiency and sustained brilliancy of the lamp. The position of the anchor is also of importance. In the Edison lamp the anchor is set in the stem, and the vibration of the filament is rather checked than entirely prevented. It is thus not strained nor weakened, as both filament and anchor vibrate together, and it is claimed that no chance exists of the branches interlocking and short-circuiting, as would probably be the case if one loop of the filament were anchored to the side of the bulb and the other left free to vibrate and strike against it.

As railway lamps are operated in series, the current capacity should be uniform. Edison railway lamps are, therefore, made in three different classes—for 500-volt circuits, for 550-volt circuits and for 600-volt circuits—in each class the lamp being selected for a given amperage. The standard railway lamps have, it is stated, an efficiency of four watts per candle at full 16 candle-power. They are fitted with the standard Edison screw base, or with bases to fit almost any make of socket. Fig. 1 shows the standard Edison railway lamp, exact size and shape.

For the decoration of cars or for headlights, or special locations in which a small compact bulb is required, the round bulb lamp is manufactured. Its filament is shaped and anchored as is the standard railway lamp, and both are furnished frosted, or of almost any desired color, either artificially dipped or in natural glass. Fig. 2 shows the round bulb lamp, exact size and shape.

The Commercial Cable and Telegraph Company.

The Commercial Cable and Telegraph Company has been incorporated under the laws of New York State, with a capital of $.00,000. The general route of the company is stated to be from New York city to Mojave, Cal., touching at all important cities on the route, and having branches from the main line throughout all the states traversed; also through the New England and southern states, and from New York to England and France. The certificate says that the company may connect with every city, town and village within the United States. The directors are John W. Mackay, of Virginia City, Nev.; Albert B. Chandler, William H. Baker and Edward C. Platt, of Brooklyn; Clarence H. Mackay, George G. Ward, George Clapperton and Charles E. Merritt, of New York city; James W. Ellsworth, of Chicago; Edward C. Bradley, of East Orange, N. J.; William C. Van Horn and Charles R. Hosmer, of Montreal, and Dumont Clark, of Schraalenburg, N. J.

LITERARY.

We have received "Instruments et Methodes de Mesures Electriques Industrielles." by H. Armagnat. It is an octavo volume of 586 pages, containing numerous illustrations and diagrams. The book is published by Georges Carre et C. Naud, 3 Rue Racine, Paris. The price is 12 francs.

The directors of the Sea Beach Railway, of Brooklyn, N. Y., last week elected C. L. Rossiter president, and T. S. Williams secretary and treasurer, the road thus becoming part of the Brooklyn Heights system.

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The old adage, "Keeping everlastingly at it brings success," has no more forceful application than in the matter of advertising. The most successful advertisers in any business are those who keep at it all the time. While no advertising is bad, some kinds are better than others, as the Kentuckian remarked about whisky. The best kind of advertising is the constant kind. Its cumulative effect is like the rolling snowball—it gathers weight as it goes. Take a common clay pipe—that's the advertisement. Strike it sharply across your wrist—that's the public. What happens? The pipe-stem breaks. Is the wrist affected? Very slightly. Divide up the same striking force into many taps, and what happens? The wrist is affected, and impressively, long before the pipe-stem breaks; and, as long as the taps are properly regulated, the pipe-stem never breaks, but keeps on doing good work. The wise advertiser is he who carefully selects his medium and then sticks to it—not one time, but all the time.

HOW TO BECOME AN ELECTRICAL ENGINEER.

On September 22, 1897, the ELECTRICAL REVIEW published the following editorial:

The ELECTRICAL REVIEW frequently receives requests from the parents of young men, as well as from young men themselves, for information as to how best to acquire the training necessary for an electrical engineer. In the past we have been in the habit of answering these inquiries by mail, according to the circumstances of each individual case as we judged them.

We have now decided to offer the following prizes for the best letters of advice as to the proper training required for a young man to become an American electrical engineer. It may be assumed at the start that the young man is not under 18 years old, and has at least a common school education.

For the best letter on this subject we will give a prize of $15 in cash; for the second in merit we will award a prize of $10 in cash, and for the third prize we will give electrical or scientific books to the value of $5, to be selected from the ELECTRICAL REVIEW book catalogue. All contributions seeking the above prizes must be in our hands not later than October 15, 1897.

We place no restrictions on the form of the communications, but suggest that, where possible, the advice be drawn from practical experience.

In response to the offer mentioned above we have received a number of contributions, from which the prize winners have been selected as follows: The first prize of $15 in cash is awarded to Mr. George B. Lauder, of Concord, N. H., inspector for the New Hampshire Board of Underwriters. The second prize of $10 in cash is awarded to a gentleman who prefers to write under the *nom de plume* of "Morris Henry." The third prize, consisting of electrical books to the value of $5, is awarded to a gentleman writing under the initials "E. E."

Mr. Lauder's letter of advice will be found on another page of this issue of the ELECTRICAL REVIEW. In the opinion of the committee to which all the manuscripts were submitted, Mr. Lauder's advice is of the thorough, practical, common-sense sort, although the training he outlines occupies a considerable number of years. In this connection, it must be borne in mind that no advice of any sort can be made to cover every case. Certain individual cases will arise, of course, which can not be governed by general advice applicable to the majority.

The ELECTRICAL REVIEW hopes that Mr. Lauder's contribution and the others which are to follow may be of benefit to its readers or to their friends.

A decision of the court at Boston on the validity and scope of the Berliner telephone transmitter patent is expected this month. The telephone companies, both independent and Bell licensees, are awaiting the decision with interest.

There is a constant widening of the electrical field.

HOW ABOUT THAT ANNUAL "BENEFIT?"

The ELECTRICAL REVIEW has hesitated during the past week about expressing itself regarding a matter of importance to the whole electrical industry. We candidly admit we were worried. We have vacillated between hope and fear, first hoping that we were right and then fearing we were. We have determined at last to speak out boldly, and therefore ask the question: Why have we been neglected? Why have we not received the usual announcement informing us that our tea-green contemporary over the way will publish its annual benefit number on January 1? The electrical fraternity knows for whose benefit this number has appeared in the past. Is it possible that its proprietor is not in need of a benefit this year? We can not believe this, judging from the padded appearance of his organ during the past few months. In fact, it is to be inferred that he is more in need of a benefit than ever. Can he have lost his nerve? We can not believe this, either. Is it possible that he has realized that electrical business men are growing tired of assisting him to swell his fake circulation averages? No, we think not. He probably still deceives himself by the hope that they can be again persuaded by his siren voice. It is reasonably certain, however, that at least one advertiser can be got with little urging to take the usual amount of space in the tea-green sheet; that is, his largest patron of former years and all years, the W. J. Johnston Company.

A recent circular sent out by our contemporary informs the prospective advertiser that he can secure space at a price, accompanied by "50 words of reading matter" without charge. The fact that both are paid for is clumsily concealed. Maybe if our contemporary will offer a 100-line reading notice, or, perhaps, 1,000 lines to each prospective advertiser, the first of January average will be swelled. In this case, however, it might be necessary, instead of counting the cubic inches of advertising in the sheet, to count the number of letters in the words in the column containing the reading notices. This would make a great showing, and we beg to suggest that it be incorporated in the usual statement.

We are glad to give this free advertisement to our contemporary in return for its many courtesies and kind words in the past, and trust that its proprietor will not fail to supplement the above with his usual whining appeal.

Wall Street and the Electrical Stock Market.

A further sharp advance occurred in the general stock market this week. Good trade conditions, excellent traffic returns and the growing feeling that there is unlikely to be any legislation at Washington that will be inimical to business interests constitute the basis for the movement. It was helped along by the announcement that the Rock Island Railroad Company had virtually sold sufficient bonds to refund about $50,000,000 outstanding, and thereby save fully one per cent on its stock. The significance of this lies in the fact that the market is receptive to good bonds, and that there are many high interest-bearing issues which are likely to be refunded within the next few years.

An exceptionally heavy demand has existed for the better classes of listed bonds all the week. It has resulted in nearly every instance in substantial advances. The buying is from investment sources, in which the savings banks figure quite conspicuously. As I have pointed out in this column, any development favoring the bond market is certain to be more potent during 1898 in promoting electrical construction than any other one factor.

No less an authority than the Boston *Advertiser* gives currency to my reference a week or two ago to the probability that General Electric will settle with its preferred shareholders on a cash basis. This authority hears that 90 or more will be offered for the stock, the purchase carrying with it the accrued dividend. As a matter of fact, the General Electric Company has been able for two years past to buy the stock anywhere from 61 up to 90, which price would include dividend accumulation. Even if the company did not have the cash with which to make the purchase, it would be very easy for it to substitute for the present preferred stock a new issue, clear of all dividend accumulations, and less in amount than that outstanding.

Although nothing tangible is yet at hand, there were further signs this week of a closer working alliance between a number of the large electrical manufacturing and insulating corporations. The Sprague–Interior Conduit consolidation is now a matter of history. The Westinghouse–General Electric pool is, of course, still in operation. The concerns named are known to be very closely allied through their large owners. The Fort Wayne corporation a year ago was in the market at a price. The Walker Company was recently bought by capitalists who have plenty of money, and who are in a position to turn over business in the form of railway equipment, electric lighting, etc. These three groups of capitalists have many interests in which they are identified, and moreover they appreciate the value of co-operation. The most suggestive development in this connection is the current absorption of electric light plants by gas company capitalists. The latest is the purchase of the Commonwealth Electric Light plant at Chicago by capitalists connected with the Peoples' Gas Light and Coke Company. Among these are said to be ex-Governor Flower and A. N. Brady, both large holders of Peoples' Gas. The Englewood Electric Light Company has also been purchased by the Calumet Gas Company.

One evidence of general business prosperity is the increase in the number of telephone instruments in use. The Bell company increased, in the month ending November 20, 15,094 instruments. Since December 20, 1896, the net increase has been 134,668, and the total outstanding 904,678. The Erie Telephone makes a similarly good showing. Its increase in October was 410 new subscribers. Its long-distance business has been increased 100 per cent as compared with a year ago, and some 200 of its subscribers were transferred from grounded to metallic circuits.

Bell Telephone enjoyed a sharp advance in Boston on Wednesday, in consequence of its instrument statement for the month ending November 20. The price went from 259 to 265, the latter figure being a gain of seven points for the week. The close was at a slight reaction. Erie Telephone gained three points in the week. General Electric preferred was very quiet and steady. There was no actual change in New England Telephone.

Pennsylvania Heat, Light and Power in Philadelphia showed considerable activity and a gain of one per cent. Electric Storage stocks were rather more active during the closing days of the week at an advance of one per cent. This movement was regarded as sympathetic with the strength of Philadelphia industrial specialties.

In the New York electrical securities market there were practically no features that were not characteristic of the general list. General Electric showed moderate strength. There was a little better inquiry for various stocks and bonds which are not listed on the Exchange.

Among the street railway dividends declared this week was one for one per cent for the quarter by Buffalo Railway, payable December 15, to stock of record December 5, and by the West End Street Railway, of Boston, on its preferred stock of four per cent, payable January 1, to stock of record December 12.

Evidence of a good demand for electrical securities was furnished Friday at the auction sale of Adrian H. Muller & Company, 111 Broadway. A lot of the property and assets of the New York Belting and Packing Company that had been hypothecated were sold to S. P. Colt at $675,000. All of these assets were first sold singly, subject to a sale of the whole. In first transactions eight Okonite bonds, par £800, sold for $4,000; 2,500 Okonite preferred shares, par £25,000, sold for $100,000, and 500 common shares Okonite, par £5,000, sold for $2,500. It is understood that the purchaser represented the United States Rubber Company.

BAIN.

Wall street, December 4.

George R. Blodgett Shot by a Burglar.

Mr. George R. Blodgett, counsel of the General Electric Company in charge of patent cases, was shot by a burglar in his home at Schenectady, N. Y., at three o'clock in the morning of December 3.

Mr. Blodgett was awakened by his wife at the time mentioned. She was aroused by having a dark lantern flashed in her face, and immediately called to her husband. Mr. Blodgett at once arose and tackled the burglar, who, while in his grasp, shot Mr. Blodgett in the right side. Dr. Vanderveer was summoned from Albany, and arrived within a short time on a special train. The General Electric Company has offered $5,000 reward for the apprehension of the burglar. The terms of the offer read as follows:

$5,000 Reward—A reward of $5,000 is offered for the arrest and conviction of the persons engaged in the commission of the burglary at the residence of George R. Blodgett, No. 11 Front street, in the city of Schenectady, N. Y., on the morning of December 3, 1897, in the commission of which the said George R. Blodgett was feloniously wounded. In case this reward shall be claimed by two or more persons, the right of selection or apportionment is reserved.

GENERAL ELECTRIC COMPANY,
By E. W. Rice, Jr., Third Vice-President.
Dated December 3, 1897.

As soon as Mr. Blodgett was shot,

GEORGE R. BLODGETT.

the burglar escaped from the house, and Mrs. Blodgett secured a revolver and fired four shots to summon help. Neighbors arrived within a few minutes and rendered all assistance within their power. The X rays were used to locate the bullet, which was lodged behind the pelvis in the groin. Later in the day an operation was performed which, it was hoped, would save Mr. Blodgett's life.

Mr. Blodgett did not rally from the operation performed on him, and died at 2.30 P. M. on December 4. He leaves a wife and one child, to both of whom he was devotedly attached.

George R. Blodgett was descended from an old New England family, and was born in Bucksport, Me., in 1862. He was prepared for college at Phillips's Academy, and entered Yale in 1880, being graduated with honors in the class of 1884. Soon after his graduation he was appointed an examiner in the United States Patent Office. He studied law in the Columbian University in Washington and was admitted to the bar. He began practice in New York city in 1888, and a year later moved to Boston, where he entered the firm of Benton & Blodgett, counsel for the Thomson-Houston Electric Company.

In 1893 he became associated with the General Electric Company, and when, a year later, its headquarters were removed to Schenectady, Mr. Blodgett went there as the chief of the patent department of the company. He gained a national reputation by his conduct of the case of the Tannage Patent Company vs. Zahn, as a result of which the control of a large portion of the tanning business of the country came into the hands of the owners of the Schultz patents. It has been said of Mr. Blodgett that no other lawyer in the country was his equal as an expert in electrical matters.

PERSONAL.

Mr. C. J. H. Woodbury, of Boston, one of the several able men with the American Bell Telephone Company, was a guest of the Waldorf-Astoria last week.

Mr. H. L. Shippy, secretary of the John A. Roebling's Sons Company, feasted his intellect in the city of Boston for two days last week, and returned well pleased with the Hub and its people.

Gen. E. S. Greeley, of New Haven, was a New York visitor last week, attending the meeting of the Loyal Legion. General Greeley is much improved in health, and while not actively in business life, is vice-president of one of the leading banks of his city and interested in its affairs.

Mr. J. R. Burdick, a pioneer in electric conduit work, is engaged in supervising part of the extensive underground work being put in by the Kings County Electric Light and Power Company, of Brooklyn. General superintendent E. F. Peck has a valuable and experienced assistant in Mr. Burdick.

Mr. E. J. Wessels has resigned the general managership of the Standard Air-Brake Company, and will enter other business. He achieved great success in creating a demand in this country and abroad for air-brakes, and retires voluntarily with the best wishes of the interest he has represented for nearly four years past.

Mr. J. C. Moulton, formerly with the Sawyer-Man Electric Company and the A B C Company, has recently severed his conection with the Rochester Lamp Company to re-enter the electrical field. He is now with the Columbia Electrical Supply Company at 329 Fourth avenue, New York city, where he will be pleased to receive his friends.

The Sprague Electric Company.

The Sprague Electric Company, into which has been merged the Interior Conduit and Insulation Company and the Sprague Electric Elevator Co., is just establishing new offices in the Commercial Cable Building on Broad street, New York city. This organization, as published some weeks ago in the ELECTRICAL REVIEW, is to manufacture the Sprague machines and apparatus, the interior conduits that have heretofore been made by the Interior Conduit and Insulation Company and the Lundell motors, of which a new series of higher units will soon be ready for mercantile introduction.

It is believed that this consolidation of interests is likely to prove a very important element in the electrical field, as the gentlemen to be identified with the company are of high standing in electrical and financial circles, both here and abroad.

TWENTY-FIVE YEARS' PROGRESS IN SECONDARY BATTERIES.*

BY I. EPSTEIN, M.I.E.E.

Expectations repeatedly raised to the highest pitch and as frequently disappointed, rash and exaggerated statements, anticipations heralded as facts—on the other hand, painstaking experiments, attention to the minutest details, resulting in slow but steady progress; this is the synopsis of 25 years' accumulator work.

As is well known, the electromotive force of electrodes composed of peroxide of lead was investigated by Schönbein (1838), de la Rive (1843) and Wheatstone (1843). The property of finely divided lead to occlude large quantities of hydrogen was noticed by Sinsteden (1854), while the credit of systematic experiments with lead plates in dilute sulphuric acid for the avowed purpose of utilizing the secondary current leading to the general use of this metal for storage purposes belongs to Gaston Planté.

Although the first results of Planté's studies were published as far back as 1859, it was not till 20 years later, during which interval the improvements in dynamo machines had rendered the generation of electricity so much easier and cheaper, that he resumed his work and fascinated the electrical fraternity by the publication of his interesting researches.

The electrical properties of the original Planté cells were excellent, and compare favorably with most of the modern types, but the process was too slow and expensive to allow its application on a commercial scale.

Faure, in 1880, conceived the idea of reducing the cost and increasing the capacity by coating lead plates with a layer of oxides or salts of lead prior to their electrical formation, and holding the paste in place by wrapping the electrodes in parchment paper and felt. The rapid destruction of the separating materials and the formation of sulphate between paste and plate led, however, to the disintegration of the active material short-circuiting the cell, defects which were obviated by placing the active material in interstices or recesses of the plate itself, which was done by Sellon and Volckmar.

The Faure-Sellon-Volckmar patents either monopolized or controlled the accumulator industry to a large extent for a considerable period. At the same time it should be ungrudgingly granted that the perseverance and pluck exhibited by these pioneers, often in the face of such disheartening disappointments as are only too common in a new industry, deserve the sympathy and praise of everybody interested in secondary batteries.

Faure's invention was hailed in certain quarters with unbounded enthusiasm. It was stated as a remarkable fact that 50 cells, forming part of several tons of Faure's accumulators, which were shipped to America and had been put on board fully charged, lit during the whole voyage two Edison eight-candle-power lamps in the smoking saloon, and a few other lamps occasionally in the engine-room and cabin; while M. Philippart, at a general meeting of the Faure Electrical Accumulator Company, gave vent to his exalted expectation in the following words: "We look upon ourselves as the sole possessors of one of the greatest inventions of the age. The only practical and economical accumulator is the Faure-Sellon-Volckmar. Everything leads us to believe that it will not be superseded."

For the verification of this prophecy consult subsequent developments.

Suggestions of improvements having for their object mainly acceleration of formation, in the case of the Planté type, or means of better retaining the active material, in the case of the Faure type and its modifications, were now forthcoming from many quarters, many of them utterly valueless, while a few led the way to important and lasting progress.

Scientific investigations kept pace with and materially assisted practical work, one of the earliest of these useful communications being Prof. Silvanus Thompson's paper, "The Storage of Electricity," read before the Society of Arts in 1881, in which he gave an historical summary, explained the chemical changes during charge and discharge, and foreshadowed the future applications of secondary batteries, while amongst other valuable contributions towards the knowledge and chemistry of secondary batteries may be mentioned those of Dr. Frankland, read before the Royal Society, and Mr. George F. Barker, at the Montreal meeting of the American Association for the Advancement of Science. Messrs. Gladstone and Tribe paid special attention to the part played by the sulphate of lead during charge and discharge, culminating in the verdict that this much maligned product—far from being wholly injurious—is absolutely requisite for enabling an accumulator to retain its charge.

Probably the first electric light plant in England in which accumulators formed an important accessory was installed towards the end of 1882, at the offices of the Electrical Power Storage Company in Old Broad street; and about the same time the first electric launch in England worked by storage batteries, the "Electricity," made its appearance.

Series-wound dynamos were often used for charging purposes, and in order to guard against a reversal of current, automatic devices were inserted in the circuit—not as yet to cut in or out, but only to ring an alarm to attract the attendant's notice.

From the very beginning great expectations were entertained of the suitability of accumulators for traction purposes, and in 1883 experiments were carried out in this country at Aston and Kew, and on the Continent in Paris. Many similar attempts were made from time to time, both in Europe and the United States, and although many of these trials were satisfactory from a technical point of view, and notwithstanding most positive statements as to the saving effected compared with horse traction, it is only now—15 years after the first experiments—that the progress made in the manufacture of accumulators offers a fair promise of realizing the hopes which have been so long deferred.

Meanwhile the public had become very eager to use this wonderful electric commodity, and the Electrical Power Storage Company not only began to supply this want, but offered a guarantee in which they stated: "Where the accumulator is properly used, the effective return is 90 per cent of the electrical energy stored." We have since become satisfied with a lesser efficiency.

Methods were devised for suitable systems of generating electricity at supply stations, and distributing it with the aid of accumulator batteries, and following a suggestion from Sir William Thomson made in 1881, Professor Ayrton, in a lecture delivered at the London Institution in 1883, advocated distribution by means of charging a large number of accumulators in series by a small current of high potential, while discharging them in sets of lower voltage. Men of science and practical engineers began to assign to secondary batteries an important part in the future, and Dr. William Siemens, in a lecture before the members of the Institution of Civil Engineers, anticipated and advocated their use for tramways and vessels.

Water power being pressed into the service of electricity, an electric light plant, in which hydraulic power and accumulators were distinguishing features, was successfully installed in the town of Nantua, France.

Temporary light installations with accumulators made their appearance, and batteries were used at a soirée at Guy's Hospital, and at a conversazoine in connection with the meeting of the Iron and Steel Institute, at Middlesborough, in October, 1883; while in January, 1884, electric lamps affixed to the "fairies'" heads at the Drury Lane Pantomime, worked by small portable batteries, dazzled the audience.

The lighting of railway carriages was inaugurated. Trains between Victoria and Brighton, in 1882, followed some years later by the New York and Washington line in the United States and the trains between Frankfort and Fulda in Germany, were the pioneers, the storage batteries being placed in the guard's van, while in the experiments carried out in 1885 on the Lancashire & Yorkshire Railway each car carried its own complement of batteries, in order to maintain the light in case of the train being broken.

About the middle of 1883 experiments with secondary batteries on telegraphic circuits were made at the General Post Office, under the auspices of Mr. Preece, the electrical engineer-in-chief, with satisfactory results.

The following passage in a letter written in March, 1885, by M. Gaston Planté to a friend who was using one of his batteries in England may prove interesting: "The plates, far from deteriorating with age (like those to which artificial layers of peroxide have been applied), become penetrated under electrolytic action more and more deeply with peroxide, which unites with them perfectly, without any danger of the plates losing their solidity." The results of 12 years' practical experience have shown the correctness of Planté's opinion.

By the beginning of the year 1885 many of the exaggerated expectations regarding secondary batteries, such as their durability and economy for tramway work, the simplicity of their treatment, and their reliability in unskilled hands, had met with disappointment, and the futile attempts at grasping brilliant successes by one bold and fortunate stroke were now succeeded by a period of patient and unremitting labor, resulting on the whole in steady progress, the very failures and disappointments offering a fresh incentive for further efforts, and forming very often the stepping stones which led to ultimate success.

Domestic lighting plants, in which accumulators played an important part, multiplied all over the civilized world.

The Edison Swan Company in New York, who had previously strenuously opposed the use of secondary batteries, now (1887) advocated their adoption, but another six years elapsed ere a secondary battery plant was connected to the mains of one of the Edison stations in New York.

The importance of improved mechanical construction forced itself upon the minds of accumulator makers, and the necessity of using devices of such a nature as—while keeping the electrodes of opposite polarity well apart—did not allow any fallen-off material to cause internal electrical leakage, led to the adoption of more suitable arrangements by leading manufacturers. At the same time the value of the specific gravity of the electrolyte as an indication of the state of charge or discharge of a cell became more generally appreciated.

Accumulators having been extensively and successfully used in connection with isolated plants for several years, their installation in central supply stations was now decided upon in England, while in the United States they had been used apart from many private plants for about two years at central stations in many of the smaller towns; and in Germany the first electric supply with accumulators as an accessory was instituted in Frankfort by none other than the Gas company.

The municipal councils of several large German towns took the lighting schemes into their own hands, and large sums were set aside for the purpose, installations comprising from 8,000 to 30,000 lights being decided upon, and the movement extended to other Continental towns.

Again, the project of running tramcars with accumulators was taken up in different countries, and sanguine estimates were based upon the results of the first few trial runs. We may mention Reckenzaun's experiments with a car in 1886 in Berlin, for which he imported the accumulators from England, and the competitive trials made at the international exhibition at Antwerp between tramcars driven by steam, compressed air, and electricity stored in accumulators, with apparently very favorable results for the electrical system.

In April, 1885, a car with Julien accumulators commenced running in Brussels; two more cars were added in the same year. They ran in 1887 alone 34,000 miles, but the financial results were unsatisfactory, owing to the rapid deterioration of the batteries, and after five years' unsuccessful attempts to make the service pay, the experiment was discontinued in 1890, and horses reinstated.

We must not forget the experiments

*From the London *Electrical Review*.

which were started with accumulator cars on the Birmingham Central Tramways in 1888, as this line was destined to hereafter become the playground and battlefield of so many rival systems.

The movement extended even to our antipodes, an electric tramcar worked by accumulators putting in an appearance at South Yarra, in Australia.

The accumulator car did not, however, confine itself to tramway tracks, for in 1889, the first electrical omnibus was run with success by Mr. Radcliffe Ward, to be shortly followed by a parcels delivery van.

While the number of electric launches on the Thames had gradually increased, the largest being "The Viscountess Bury," which, with its length of 68 feet, has up to the present maintained its position with regard to size, it was but natural that a motive power requiring no fire and giving off no noxious products should recommend itself for propulsion under water, and a number of experiments with submarine boats driven by accumulators were tried. A boat of such description was run in Liverpool in 1886 with complete success, and another in the following year in France, the results inspiring the Paris *Figaro* with the prediction that "this invention is destined to give France the Sovereignty of the Seas."

For telegraphing accumulators had proved eminently satisfactory, and batteries having been employed to a considerable extent at the Central Telegraph Station in Berlin since 1888, a further increase was decided upon.

Scientific investigations again came to the assistance of the practical workers, among the most noteworthy being Professor Ayrton's paper "The Working Efficiency of Secondary Batteries," read in 1890 at the meeting of the Institution of Electrical Engineers at Edinburgh, in which were embodied all those precautions as the then state of the batteries rendered indispensable for satisfactory working, and of such a practical nature that the instructions which related to the necessity of charging at low rates, avoidance of rest and guarding against leaving cells in a discharged state, even for a short time, were almost generally adopted.

Soon hereafter, however, such progress was made in the manufacture of accumulators, more especially of an improved Planté type, that their robust construction rendered such precautions unnecessary, and Professor Ayrton himself as the result of lengthy tests was the first to acknowledge the fact.

For the guidance of attendants of private installations which had increased to a large number, Sir David Salomons published in 1886 a practical handbook "On the Management of Accumulators," which has since seen many editions and proved of real service.

Another important application for accumulators is that for electric welding. By the Benardos system the piece to be worked is connected to one pole and a carbon rod to the other pole, thus forming an arc. Messrs. Lloyd & Lloyd, of Birmingham, introduced this system at their works in 1890.

By the beginning of the year 1894 storage batteries as auxiliaries in central stations had been working a sufficient number of years to justify the wisdom of their adoption; they had proved economical and of an average efficiency of about 80 per cent, and as their lasting properties were satisfactory, makers were emboldened to enter into maintenance contracts at moderate rates.

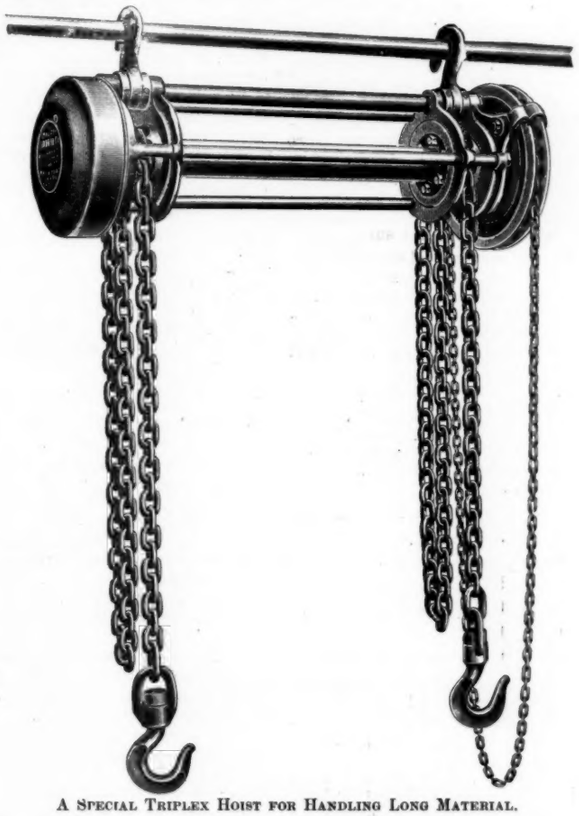
Two interesting and large installations of accumulators on tramcars, which denote new methods of working, are those in Paris and Hanover. On the Puteaux line in Paris, the batteries, which are of sufficient capacity for the day's total run, are recharged during each stoppage at a terminus, the time varying between 12 and 20 minutes, and the charging being effected not as was usual hitherto at a constant current, but at a constant voltage. It has been found possible by this method to recharge the batteries within a short time, 50 per cent of the total charge being restored within the first hour, 75 per cent at the end of the second hour, and 83 per cent at the end of the third hour, and the advantages claimed are more rapid charge, prevention of overcharge, and less wear and tear of batteries.

On the Hanover line a mixed system of trolleys and storage batteries is used. It was determined in 1895, when the first accumulator car started running, to try the experiment of charging the accumulators during the journey from the existing overhead conductors. At the beginning of 1897 there were about 12.8 miles of tracks with the overhead conductors, and 10.6 miles worked by accumulators. The charging is effected over distances varying from 1.7 to 4.8 miles, the discharging taking place over distances from three miles to 7.2 miles, but as there is not sufficient pressure at all parts along the trolley wire a supplemental charge is given after the car has returned to the shed. Each car carries 208 cells; when the battery is switched on, they are first arranged in two halves in parallel with resistance inserted, then the resistance is gradually cut out, and finally the two halves arranged in series. The financial results of this line, according to official reports, are favorable, as taking everything into consideration, the extra cost of accumulator traction as compared with the trolley system does not exceed one-tenth of a penny per mile.

The possible improvements for obtaining the maximum capacity and discharge rates in an accumulator pointed from the beginning in three directions; with the pasted types to an increase in the volume of the active material compared with the grid or other support, with Planté types to the highest development of surface compatible with the required mechanical strength, and to chemical preparation with a view to more rapid electrical formation.

Actually, we see in the listed types of the first-named class that the weight of the active material has considerably increased with a corresponding reduction of the support; but as the latter offers no longer the necessary mechanical assistance, other devices had to be resorted to, such as inclosing the electrodes in porous or perforated envelopes.

Again, the importance of using the active material in a highly porous condition, so that the electrolyte may have free access into the interstices of the plates being recognized, while material of such description is naturally liable to more rapid disintegration, binding materials of organic or inorganic origin are used by some makers.



A Special Triplex Hoist for Handling Long Material.

How far and for how long these mechanical or chemical remedies will fulfil their purpose, only further time can prove.

Alloying the lead with some other metal and eliminating the latter subsequently was another means frequently suggested, patented and tried; but with one notable exception these means have been abandoned, probably by reason of the difficulty of removing the last traces of the foreign substance, the presence of which proved detrimental to the satisfactory working of the cell.

As regards accumulators of the Planté type, expedients for obtaining an increase of surface were mainly two-fold; namely, either making slabs of lead particles while the latter were in a crystalline state, or simply using ordinary metallic lead offering a large surface in the form of lead strips with or without a central web.

The chemical treatment alluded to consists in either subjecting the electrodes prior to their formation to the action of some suitable corroding agent, or adding the latter to the formation electrolyte. Some of these processes have been found highly satisfactory, while others, after giving excellent results for a number of years, were subsequently abandoned.

Great expectations were raised at one time by the "Waddell–Entz" alkaline accumulator, a derivative of the Lalande – Chaperon primary couple, with its positive electrode of finely divided copper, highly compressed, and its negative of electrically deposited zinc, in a solution of caustic potash. Batteries of this type were tried with apparent success for tramways and submarine boats, their weight comparing favorably with existing lead accumulators. It appears, however, that unforeseen difficulties were encountered, and very little is heard of this type now.

We meet the storage battery to-day in almost every branch of applied electricity as a well recognized and duly appreciated commodity.

Thousands of private electric lighting plants and hundreds of central supply stations testify to their utility and economy, and for electrotyping, telegraphing, telephoning and many other purposes they form valuable adjuncts.

Embodying as they do the ideal form of traction, the objection to their use on the score of expensiveness—which was only too well founded in years gone by—is being gradually overcome, thanks to the improvement in the manufacture and the better understanding of the treatment, and the latest financial results obtained in Hanover seem to prove that they have entered the era of economical success.

Large numbers of electric launches easily navigated compare favorably with their steam or oil rivals, and the black and yellow electrical cabs are daily becoming a more familiar sight in the London streets.

Although no sudden startling evolution has marked the history of storage batteries, it will be granted that very substantial progress has been made. The force of facts has converted opponents into allies, while the current of public opinion flows strongly in their favor.

A Special Triplex Hoist.

The accompanying illustration shows a special form of the Weston triplex chain block, made by the Yale & Towne Manufacturing Company, of Stamford, Ct., and 84–86 Chambers street, New York, especially designed for handling long material, such as bars, beams, lumber, etc.

It consists of a triplex block, with its mechanism separated into two parts, coupled by means of shafts and separators, and provided with two hoisting chains, the combined strength of which is equal to the lifting power of the block. The hoist can be so built as to separate the two hooks any distance desired, according to the character of the material to be handled. The hoist may be hung from a fixed support, as in the illustration, or from a trolley on an overhead track or crane, as desired.

The hoist, thus provided with two lifting chains and hooks, always moving together, is adapted to a wide range of uses, and for the handling of long material is much better than a block with a single lifting chain. The latter is sometimes used with a yoke, having hooks at each end, but this arrangement is less steady than the one shown in the illustration, and necessarily occupies much more head room. The triplex hoist with two lifting chains will doubtless commend itself for a wide variety of uses.

NOTES ON THE RATING OF ELECTRIC POWER PLANTS UPON THE HEAT-UNIT STANDARD.*

BY WM. S. ALDRICH.

These notes refer to a paper† on this subject read by the author before the Hartford meeting (May, 1897) of this society. No comparative data were given in the original paper. It was known that the Committee on Data of the National Electric Light Association had a report in preparation for the Niagara Falls convention, June 8, 1897. This was the fourth, and probably the last, of such valuable reports. It was deemed expedient, rather than refer to the previous reports, to await the publication of the 1897 report for the data needed in discussion of the author's paper.

The earlier reports of the above Committee on Data have been full of instructive information relating to many types of steam-power electric plants. In all of the cases finally reported, their rating has been based on watt hours per pound of coal. Over three years ago Mr. F. M. Rites, at the Montreal meeting of our Society, discussed the data of the Washington convention of the association (1894). His remarks‡ at that time were so pertinent to the whole question of the economy of electric power plants that it will not be amiss to quote them here.

"It is impossible that competent engineering ability should be confined exclusively to the manufacturing industries.

"It can not be assumed that the average intelligence of the designers and operators of electric light stations is inferior to that displayed in establishments of different character, and yet the enormous discrepancy between the actual results and those which should be realized surely deserves some attempt at explanation.

"It is but proper to note that the committee has chosen the record of a very high duty as a basis of comparison, and that the nature of the exacting service of electric light and street railway plants precludes the possibility of a close approximation to the highest economy under more favorable conditions; but these figures are entirely unexpected and, incidentally, somewhat ridiculous, considering the energy with which the last per cent of efficiency of the electric apparatus is insisted on by its users.

"Possibly some reason for such a remarkable state of things may be found in the miscellaneous engineering errors which usually follow an ignorantly wasteful policy, but these are as frequently met in other power plants. Perhaps, also, stations improperly proportioned and generally unfitted for economic competition may be found in the list, but these are far from sufficient to account for such universal failure to realize even a moderate degree of efficiency.

"There seems to be but one general explanation applicable to electric light or railway stations which can account with any degree of probability for such extravagant fuel consumption, and that is the excessive wastefulness of the steam engine under varying conditions of load."

It is proposed in the present paper (I) to discuss briefly the progress shown during the past four years in the economic performance of steam-power electric plants as summarized by the Committee on Data of the National Electric Light Association; (II) to show that the very low economy of such electric light and railway stations is not entirely due to uneconomical engines and variable loads; (III) to present a few notes upon a further consideration of the heat-unit rating for such plants. This treatment will have specially in view the necessity for some standard rating by means of which the design, installation, testing, and management, as well as specifications and contracts for these plants, may be reduced to a satisfactory basis for advancing this industry along engineering lines.

I—PERFORMANCE OF ELECTRIC POWER PLANTS ON A COAL BASIS.

From the several reports of the Committee on Data of the National Electric Light Association, Tables I and II have been compiled. An inspection of these will show what little progress has been made during the last four years in such installations. In fact, the expectations of the (1894) committee seem not to have been realized, in that they looked for much better values in the reports of subsequent years. It is a matter with which the mechanical engineer is most directly concerned. His work in the design and installation of even the most recent central station is open to criticism that can not be applied to the electrical features of the same. Electrical engineers themselves acknowledge that the efficiency of the modern dynamo has practically reached the limit set by structural and economic considerations. Mr. Rites's remarks, quoted above, are singularly applicable to the conditions existing at the present day. In the light of what he has said, the following comparative data should be carefully studied by the mechanical engineer:

TABLE I.

SHOWING RESULTS OF FOUR YEARS' PROGRESS IN THE ECONOMIC PERFORMANCE OF STEAM-POWER ELECTRIC PLANTS.

Year.	Convention of the Nat. Electric Light Association at—	No. of Stations Reported.	Watt Hours Per Pound of Coal.		
			Max.	Min.	Avg.
1894..	Washington.....	65	208	25	91.7
1895..	Cleveland.....	24	202	36	128
1896..	New York.....	81	237	33	108
1897..	Buffalo.	14	269.5	98.7	156

A comparison of the above, with some of the best results obtained in modern mill engines, has been noted by the committee, as follows:

In the 1894 report, compared to the performance of the engine of the Chelsea Jute Mills, Brooklyn, N. Y., showing a coal consumption of 1.482 pounds per indicated horse-power per hour, with the load varying from 495.21 to 764.96 horse-power, if such a performance were possible in the central station, it should result in over 400 watt hours per pound of coal, on the basis of the committee's assumption of 90 per cent for the mechanical efficiency of the engine and for the same efficiency in the dynamo.

In the 1896 report, the committee called attention to the then world's record for steam economy, as shown by the Chestnut Hill pumping station engine at Boston—a steam consumption of 11.22 pounds per horse-power per hour, or an effective pump horse-power per hour on 1.34 pounds of coal. If the efficiency of the direct-connected electric generators should compare favorably with that of the pumps of this engine, with no allowance for variation in load, anthracite coal used in the plant, with the same economy of installation, should produce 557 watt hours per pound of coal.

In the 1897 report of the committee, Mr. F. R. Low, member of our society, very fully discussed the several sources of loss in the electric power plant, stating the discrepancies would be made up mainly from the following items: 1. Decreased boiler efficiency. 2. Lesser normal efficiency of engine. 3. Impaired conditions of engines. 4. Unfavorable engine load. 5. Leakage. 6. Condensation. 7. Auxiliaries. 8. Heating. It is not our purpose to discuss this admirable report, but their is no reason why every feature of installation of an electric power plant should not be as fully considered in design and construction as in the case of the modern high-duty pumping station. If fact, it has been repeatedly pointed out that the chief differences are those due to the running conditions of electric plants, and not entirely due to sudden and wide variations of load. Messrs. A. G. Pierce and R. S. Hale report* of the performance of the Boston stations of the Edison companies: "In our test we have finally found the variation, due to causes which we first thought negligible, to be more than the variation due to the change of load."

In this connection it is important to notice the results of Mr. H. A. Foster's analysis of the tests of 22 different power plants.† These included manufacturing establishments, electric light stations, pumping engines, etc. Plants above 200 horse-power show a remarkable uniformity in fixed charges; namely, taxes and insurance. The operating expenses gradually decrease in plants from 200 to 1,000 horse-power, above which capacity the operating expenses seem to remain remarkably uniform and quite irrespective of load variations. The large electric stations supplying many smaller industries are scarcely affected by the instantaneous load changes in one or more of these particulars.

The conclusions to be drawn from all of the preceding clearly indicate that the economy of the modern high-duty pumping-engine plant is due to a refinement of design and economic arrangement of the installation that has not yet been reached in the electric power plant. Anything which tends to advance the latter industry along the lines which have been so clearly marked out in the development of the former, merit the attention of those having such work in hand. It is believed that the standard heat-unit specifications and the subsequent contract trials of pumping plants upon this basis have combined to develop this industry to an unprecedented degree.

It is not, therefore, too much to expect that similar standard heat-unit specifications and contract trials of electric power plants will advance this industry also along the same engineering lines. At least the efficiencies, economies, guarantees and contracts now being realized in pumping stations should be much more nearly approached by the modern electric power plant.

(To be concluded.)

TABLE II.

EQUIPMENT OF THE STATIONS GIVEN IN TABLE I, SHOWING THE MAXIMUM AND MINIMUM ECONOMY.

Year.	Economy.	Boilers.	Engines.	Dynamos.	Daily output, watt hours.	Fuel.
1894	Maximum (208)	.....	.....	Arc, power and incandescent.	7,971,600	Coal, hard screenings.
	Minimum (25)	.....	.....	Arc and incandescent.	80,670	Coal.
1895	Maximum (262)	Horizontal water tube.	Triple exp. condensing.	Direct connected.	22,967,952	½ soft coal, ½ hd. screen'gs.
	Minimum (36)	Horizontal tubular.	High speed non-condensing.	Belted direct.	2,790,565	Bitumin. pea.
1896	Maximum (237)	Horizontal tubular.	High speed comp. condensing.	Belted direct.	8,870,392	Bitumin. lump.
	Minimum (33)	Horizontal tubular.	High speed condensing.	Belted direct.	203,555	Anthracite buckwheat.
1897	Maximum (269.5)	Water tube.	Vertical comp. condensing 4-valve.	Direct connected incandescent.	.....	.....
	Minimum (98.7)	Horiz tubular and water tube.	Comp. condensing.	Belted to dynamo.	.....	Screenings.
			Comp. condensing.	Belted to crank sh.	.....	

* Read before the American Society of Mechanical Engineers, New York city, December 2, 1897.

† "Transactions" of the American Society of Mechanical Engineers, vol. xviii., No. 733, "On Rating Electric Power Plants upon the Heat-Unit Standard," by William S. Aldrich.

‡ "Transactions" of the American Society of Mechanical Engineers, vol. xv., No 599, "A New Method of Compound Steam Distribution," by F. M. Rites.

* Quoted by Mr. F. R. Low, report of Committee on Data, National Electric Light Association, Buffalo meeting, June 8, 1897.

† "Transactions" of the American Institute of Electrical Engineers, vol. xiv., "Variations in the Cost of Steam Power," by Mr. H. A. Foster. Paper presented at the annual convention, July 28, 1897.

Summoning Help by Cutting Wires.

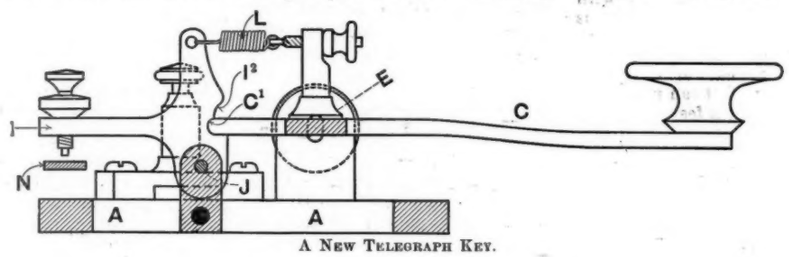
The person who wrote that electricity was one of the "mighty agents of nature enchained by the ingenuity of man" can scarcely have contemplated in his wildest dreams the full extent of that ingenuity. For instance, he is scarcely likely to have prophesied that a sick man, far from the habitations of civilization, would have cut a telegraph wire in order to obtain assistance. And yet such has really occurred, according to a London contemporary. The whole of the vast continent of Australia was practically cut off from European news for nearly 24 hours in the middle of September in consequence of an interruption on the line between Adelaide and Port Darwin. Inquiries were made, and it was found that the wire had been cut by a cyclist who was taken ill while on a journey across the continent. It is not related how he set about it, but he had the satisfaction at any rate of getting what he wanted. It is not desired to establish this as a precedent of summoning help under inconvenient circumstances.

With a charming special cover designed by Charles L. Hinton, reproductions of some historic Madonnas and pictures by F. S. Church, Charles Dana Gibson, Ernest C. Peixotto, C. K. Linson and other well known artists, the Christmas number of *McClure's Magazine* is in generous keeping with the season. It is indeed a beautiful holiday number. It is quite as eminent in matter as in illustration, having contributions from Rudyard Kipling, Anthony Hope, Charles A. Dana, Robert Barr, Bliss Perry, Ella Higginson, W. T. Stead and Dr. Sven Hedin. Anthony Hope gives us the first instalment of the sequel to "The Prisoner of Zenda." It opens most engagingly.

A New Telegraph Key.

An invention which should be hailed with delight by every telegraph operator is the key just patented by Mr. E. W. Farnham, of the Chicago, Burlington & Quincy Railroad Company. Mr. Farnham, who is a practical telegrapher, has for some time been at work on the problem of improving the telegraph key, primarily with the end in view of preventing that scourge of operators, known as telegraphers' paralysis, and secondly, in a desire to simplify the work of the operator. There are other minor advantages also claimed for this new key.

The inducing cause of telegraphers' cramp, or paralysis, is the constant solid concussion between the key and the anvil, continued for hours, which ultimately affects the nerves of the hand and wrist. It requires 77 of these blows to go once through the Morse alphabet, omitting the figures and other marks. If a common pipe-stem is struck smartly on one's wrist, it will break, but if that blow is divided up into a few hundred, the wrist may be made very sore long before the pipe stem will give out.



A New Telegraph Key.

Mr. Farnham has made the blow on the anvil a yielding one, thus destroying the shock. This is accomplished through a secondary lever, moved by the ordinary key, the opening spring being attached to the secondary, which is of a "T" shape. The principle of increasing motion by increased leverage is taken advantage of, so that a very minute and particularly easy motion of the hand does the work, while the contact between the key and the anvil is silent and yielding, the latter being a spring. The contact is one, too, which is said to be far less liable to fouling and making an imperfect signal, because of the slightly sliding contact motion.

The circuit-closer is also done away with in Mr. Farnham's key. The contact between the key lever and the secondary lever is of such a nature as requires but a slightly extra pressure to close the key permanently, and in this position it is far less liable to accidental opening through handling books, blanks, etc., on the operator's table.

The illustration herewith will make the points clear. The base of the key A is quite similar to the ordinary base. The key lever C is movable on the trunnions E, but ends at C', where it makes mechanical contact with the secondary lever I, which is somewhat "T" shaped, centered at the lower extremity, at J, while the upper part has an adjustable spring L. The third portion of the lever carries the contact point directly over the spring anvil N.

Now a depression of the key acts upon the secondary lever through the lower of two contact notches, or hollows in the secondary lever, closing it at N, and, on opening the key, the spring L acts to open the contact at N. Above this lower notch is seen another, I², into which, by a slightly increased pressure on the key, the end at C is forced, which depresses N still further than in the writing contact, and locks the key firmly. To use the key anew requires but a slight lifting pressure, while an accidental opening is said to be almost impossible.

CHICAGO ITEMS.

Among the several eastern visitors none is more welcome in Chicago than the genial "Charley" Wirt, who makes the brushes that don't spark and often outwear the commutator. Mr. Wirt, as usual, was in a hurry and barely had time to shake hands with old friends.

Mr. A. W. Paine, the successful Chicago representative of the Northern Electrical Manufacturing Company, reports the sale of several large-sized motors recently. Mr. Paine reports that wherever prospective purchasers take the trouble to thoroughly investigate the good points of Northern apparatus a sale invariably results.

Although having been established but a few weeks, the firm of Meysenburg & Badt already finds it necessary to secure larger quarters to take care of its rapidly growing business. It has secured suite 1503–4 Monadnock Block, which is now being fitted up for them, and where they will be nicely located the coming week.

Since the ordinance requiring all street cars to be provided with some approved form of fender has gone into effect, several of the street car companies are experimenting with a view of getting up a device which will meet the approval of the city. Since there are a number of good fenders on the market, and successfully in use on many other roads, it would seem an easy matter to adopt some efficient device instead of experimenting for the sake of saving a few dollars.

The Chicago Twin-Wire Long-Distance Telephone Company, which since 1893 has had a franchise to do a general telephone business in Chicago, has applied to the City Council for an extension from December 1, the time the franchise was to expire, owing to inaction of the company. The application has been referred to a committee, and the aldermanic friends of the company claim that as long as the council has the extension proposition under consideration, the franchise is simply in abeyance and can be revived at any time by the granting of the extension. The company controls the D'Unger patents and gave bonds to the amount of $60,000, which will be forfeited in case the council fails to grant the extension.

The problem of obtaining some $3,500,000 for the purpose of completing the Northwestern Elevated Road, mention of which was made in last week's Electrical Review, seems to have been solved according to reports, and it is announced that work upon the property will be prosecuted as rapidly as the weather will permit. Negotiations have been conducted with the Central Trust Company, of New York, it is understood, for a loan of approximately $3,500,000, bonds to be placed as collateral security.

Upon the basis of previous loans, $7,000,000 of bonds would be required to obtain this amount. The actual investment in the property now amounts to $5,525,000, of which $1,065,000 was secured on loans from local banks and the Pullman company, $2,055,000 in bonds being deposited as collateral security. It is estimated that the completion of the road will require about $2,000,000, leaving the balance of the $3,500,000 for which arrangements have been made available for taking up this floating indebtedness, and the recovery of the bonds.

The probabilities of an interesting law-suit between the Union Elevated Loop and the city are very strong. Shortly after the loop began operations, several of the larger stores located on the line realized that it would be of immense advantage to them and quite a convenience to their customers to have platforms or bridges from their stores to the loop tracks. One store, at least, completed such a bridge, and very promptly a howl came from several stores not so favorably located, with the result that, by orders of the council, Commissioner McGann ordered the bridge taken down. In reply, general manager D. H. Louderback, of the Union Loop company, sent in what one of the Aldermen called a "a sassy letter." Mr. Louderback told the council that it could not pass any ordinances prohibiting the company from building platforms into the second stories of downtown stores. The letter also contained an implied threat that, if any action was taken to prevent the company from building these loop bridges, the company would not feel obliged to pay into the city the compensation which was agreed upon between Mayor Swift and the company. The communication was sent to the Corporation Counsel, with instructions to advise the council.

Chicago, December 3. C. E. K.

TELEPHONE NEWS AND COMMENT.

The New England Telephone and Telegraph Company announces that new offices have been established on their line as follows: South Shaftsbury, Sunderland, Arlington, East Arlington, Manchester, Pawlet, West Pawlet and Granville, Vt.

The Delaware and Atlantic Telephone Company is having a new line erected between Media, Pa., and Newtown Square. The old line has become insufficient to give satisfaction to the customers and a new metallic circuit is being put up. Two wires will be used instead of one.

At a meeting of the stockholders of the Harrison Telephone Company, of Owensboro, Ky., the following directors were elected to serve during the ensuing year: James H. Parrish, Wilford Carrico, Richard Monarch, Joseph W. Slaughter, John W. Carter, J. S. H. Kiegel and H. K. Cole.

The American Bell Telephone Company's instrument statement for the month ended November 20 shows :

	1897	1896	1895	1894
Gross output.	29,023	15,185	18,439	9,815
Returned....	7,817	9,073	6,142	6,502
Net output..	21,206	6,112	12,297	3,313
Since Dec. 20 :				
Gross output.	214,897	178,346	161,631	81,021
Returned.....	84,068	84,872	73,957	65,630
Net output..	130,829	93,474	87,674	15,391
Total outs'dg.	904,678	770,010	670,180	581,892

The Harrison Telephone Company has just completed its line between Rapid City, S. D., and Deadwood and all the intervening points. This gives two lines which are in close competition. The very low rate of $1.50 is given for the entire circuit of the Hills. The Harrison company, it is said, will extend its line into the southern Hills, where it will still further compete with the old company.

The Maryland, Pennsylvania & West Virginia Telephone and Telegraph Company, recently chartered in West Virginia, with an authorized capitalization of $1,000,000, will, it is claimed, soon develop the territory of the three states named. The incorporators backing the new enterprise are Milton J. Baird, of Pittsburgh, Pa.; J. J. Hoblitzell, president of the Savage Brick Company, Keystone Junction, on the Baltimore & Ohio Railroad ; J. M. Reynolds, Bedford, Pa., and others.

An independent Calhoun County Telephone Company, of Adrian, Mich., with a capital stock of $100,000, has been organized. The officers are : President, W. S. Kessler ; vice-president, F. E. Palmer ; treasurer, A. J. Little ; secretary, F. L. Irwin. The general office will be at Battle Creek. The company will have a thirty-year contract with the new State Telephone Company for service outside the county. Long-distance 'phones will be used. Rates will be $24 a year to business houses, $12 to farmers, and the charge for talking to any part of the county will be 10 cents.

ADVANCE INFORMATION

Electric Light and Power.

LEBANON, OHIO—The Lebanon Electric Light Company has been incorporated by J. W. Newcomer, C. C. Shickelman, F. O. Werk, W. G. Thompson and William McDowell. Capital, $26,000.

LONG ISLAND CITY, N. Y.—The Bowery Bay Electric Light and Power Company, to furnish electricity for lighting and other purposes, has been incorporated. Capital, $10,000. Directors: George Ehret, John B. Hasslocker and Edward M. Burkhard, of New York city; Louis von Bernuth and Walter C. Foster, of Long Island City.

COLUMBIA, N. Y.—The Columbia Manufacturing Company, of this city, has secured the contract to furnish the appliances for an electric light plant in Kuschequa, Pa.

CAMMAL, N. Y.—The electric light plant at this place is to be enlarged.

GRAND FORKS, N. D.—W. I. Cray & Company, of Minneapolis, have been awarded the contract for putting in a municipal electric light plant for this city at a cost of $12,703. Including the building, the plant will cost a little over $15,000.

HOLYOKE, MASS.—The board of public works of this place has decided to place a private electric lighting plant in the new high school building.

HARRIMAN, TENN.—The City Council has decided to buy and install an incandescent lighting plant, and the Mayor, Treasurer and Clerk were authorized to sell $5,500 worth of bonds and purchase the outfit, which will consist of a 1,500-light dynamo and a 15 horse-power engine.

HARVARD, MASS.—A franchise has been granted to the Sargent Electric Light Company, of Ayer, to supply the town with power and light. William Sargent, of Ayer, manager.

OWENTON, KY.—An electric light plant is to be established here.

CUMBERLAND, WIS.—The Cumberland City Council has voted to put in an electric lighting system at once, and has levied a direct tax to cover the expense.

ELIZABETHTON, KY.—R. L. Wintersmith, Mayor, may be addressed concerning the erection of an electric light plant.

TIFTON, GA.—The city has accepted a proposition from Capt. H. H. Tift for the supplying of electric lights.

EAST BARNET, VT.—An electric light plant is to be established here.

JACKSONVILLE, FLA.—A complete electric light plant has been installed at Cummer's mill, and that place is now entirely lighted by electricity. The wharf is brilliantly illuminated with arc lights.

MARQUETTE, MICH.—The buildings of the Isle Royale Mining Company are now equipped with electric light, and the question of extending the service from the mine to Hurontown is now being agitated.

IDAHO SPRINGS, COLO.—An immense electric power plant is to be put in at this place by eastern capitalists to supply power for mining, milling and transportation.

MONTOUR FALLS, N. Y.—The electric light plant at this place will be in full operation by January 1, it is reported.

ROODHOUSE, ILL.—The electric light plant at this place is being reconstructed, and the lights will again be turned on soon.

MIDDLETOWN, N. Y.—Electric Light and Power Company has been incorporated; capital stock, $25,000. Directors: Clarence S. Abrams, T. E. Hayes G. H. Iseman, N. I. Hayes and Charles H. Bruik, of Middletown.

MARION, VA.—The Mayor may be addressed concerning electric lights, for which the city has granted franchise to a New York company.

New Telephone and Telegraph Companies.

KITTANNING, VA.—The Local Telephone Company has extended its line to Rosston. Along the line a number of 'phones have been placed. A code has been devised so that each 'phone is called by a certain number of rings of the bell.

INDEPENDENCE, VA.—A telephone line is being built from this place to Elk Creek by Messrs. Dickey, Lundy & Company.

LEWISBURGH, PA.—The telephone line in Snyder County is to be extended from Middleburg to McClure, and ultimately to Lewistown.

MENA, ARK.—The Mena Telephone Company has completed a system of telephone lines for this city, and in a few days will be in active operation. The company starts with 120 subscribers.

HARRINGTON, DEL.—The poles for the proposed telephone line between this place and Milford have been prepared by contractor Ezekiel Fleming, and the line will soon be in operation. This will put Harrington in communication with all of the important towns in the lower part of the state.

EAU CLAIRE, WIS.—The Wisconsin Valley Telephone Company, of this city, has decided to push the new line to Ashland from Hayward, and Eau Claire will talk with Ashland inside of two weeks.

NILES, MICH.—Dowagiac parties are negotiating for the purchase of the Gilliland telephone system at Niles.

MARIENVILLE, PA.—Marienville and Tionesta and Elk County are now connected by telephone.

STURGIS, KY.—A telephone exchange has been established at this place.

EVANSVILLE, KY.—The Union County Telephone Company is now at work on a long-distance line from this place to Paducah.

LA GRANGE, IND.—A telephone company has been organized here for the purpose of building telephone lines which will compete with the American Bell company.

TOPEKA, KAS.—The Missouri & Kansas Telephone Company is extending its line to Emporia.

KENDRICK, IDAHO—The telephone line which is under construction between this place, Pierce City and Nezperce will be completed as far as Leland at once.

COOKEVILLE, TENN.—A telephone line from this place to Carthage has been put up by the Nashville & Knoxville Railroad Company.

DOVER, DEL—The Diamond State Telephone Company is extending its line from this place to Cheswold.

HARDINSBURG, KY.—There is an effort being made to build a telephone from this place to McDaniels by the way of West View, and also to build one from this place to Glendeane.

New Electric Railways.

LIMA, OHIO—Plans are being projected for an electric railroad from this place to Columbus. The trial plans for a branch road through Kenton to Ada are in hand.

UNION CITY, TENN.—The Obion & Tiptonville Rapid Transit Company has been incorporated. Directors, G. B. Morris, W. M. Wilson, R. S. Lyons, T. J. Oglevie and J. H. McDowell. The company proposes to construct and operate an electric railway from Tiptonville via Glass, Hornbeak and Samberg, crossing the lake on the county bridge. A branch is also projected, leaving the above-mentioned line at a point one-half mile west of Glass, thence to Elbridge and Lane's Ferry to a point on the Mississippi River opposite Caruthersville, Mo.

HARRISBURG, PA.—The Doylestown & Willow Grove Traction Company has been incorporated, with $10,000 capital. Directors, D. N. Walmsley, Carroll R. Williams and Joseph Jones, of Philadelphia; Samuel Steckel and G. P. Brock, Doylestown. The road will be in the counties of Bucks and Montgomery, and its general office will be at Doylestown.

NORRISTOWN, PA.—The residents of Conshohocken are to have another trolley line. The state department at Harrisburg has issued a charter to the Stoke-Pogis Railroad Company, which will construct a line to run from Rosemont to West Conshohocken, a distance of three and one-half miles. The capital is $50,000. Frederick Phillips is the president of the new company. The directors are Clinton Gage, J. M. Whitlan, William M. Kerr, George C. Shoff, Henry C. Landis and J. N. Trainor, all of Philadelphia.

NEW BRUNSWICK, N. J.—The Brunswick Traction Company has opened its trolley road to Metuchen.

WILMINGTON, DEL.—Ground has been broken for the Wilmington & Brandywine Springs Electric Railway.

New Incorporations.

HARTFORD, CT.—The Harriman Electric Specialty Company has been incorporated. Its object is to buy, sell and make electrical instruments. The capital stock is $5,000, and the stockholders are H. W. Fox, T. J. Blake, F. H. Harriman and F. R. Cunliffe.

CHICAGO, ILL.—The Hertel Manufacturing Company has been incorporated to deal in motors; capital stock, $50,000; incorporators, Max E. Hertel, Paul Kraemer and F. M. Peters.

PITTSFIELD, MASS.—The K. & W. Company has been incorporated, with a capital stock of $10,000. Directors, William A. Whittlesey, president; Frank R. Whittlesey, treasurer, and John H. Kelman. The company is formed for the purpose of manufacturing electrical supplies and incandescent lamps.

PORTLAND, ME.—L. I. Fletcher Company has been organized for the purpose of dealing in electrical machinery and goods, with $25,000 capital stock. The officers are, president, Lewis I. Fletcher, of Lowell, Mass.; treasurer, George E. Grant, of Boston, Mass.

LOS ANGELES, CAL.—The Southern California Electric Supply Company has been incorporated to deal in electrical apparatus. The capital stock is $50,000, and $20,400 is actually subscribed. The directors for the first year are Russell H. Ballard, Daniel B. Kearney, George P. Curtis, William K. Percey, all of Los Angeles, and Albert C. Jewett, of San Francisco.

GROVETON, N. H.—A stock company has been formed at this place for the purpose of manufacturing the Tirrill Automatic Potential Regulator, to be used for regulating dynamos, an invention of Allen A. Tirrill, of this place. The company has been organized, with a capital stock of $30,000. The names of the stockholders are Irving W. Drew, George R. Eaton and W. P. Buckley, of Lancaster; Dr. C. C. O'Brine, C. T. McNally, Fred McDonald, E. E. Tibbetts, P. S. Tirrill, of Groveton, and A. A. Tirrill, of Whitefield. The following officers have been elected: President, I. W. Drew; treasurer, C. C. O'Brine; clerk, W. P. Buckley; manager, A. A. Tirrill.

NEW ORLEANS, LA.—The Gardner-Moor Company, Limited, has been incorporated by Theodore Grunewald and others. Capital stock, $250,000.

BIRMINGHAM, ALA.—The Kitson Hydro-Carbon Light Company has been organized, with H. W. Perry, president; J. W. Minor, vice-president and general manager; J. W. Scriggs, secretary, for the manufacture and introduction of the Kitson hydro carbon light, to make apparatus, etc. Capital stock, $50,000.

Business Troubles.

CLEVELAND, OHIO—The Ahlm-Edwards Electric Company, doing business at 1030 Payne avenue, has made an assignment. The company manufactures electrical goods. W. J. Hart is named assignee.

Kindred.... ...Interests

The General Electric Company has issued a special pamphlet illustrating and describing in detail Edison incandescent lamps for electric railway service. These lamps are made in the pear shape and spherical forms.

The Central Electric Company, Chicago, announces that they are carrying full lines of the Bryant, Perkins, Hart, Paiste and Anchor specialties, and are prepared to make shipments of any quantities of these well known goods from stock.

The Hatch Storage Battery Company, 53 State street, Boston, has issued a new catalogue illustrating and describing the improved Hatch accumulator. The catalogue also contains an illustration showing the company's recently purchased factory at Millis, Mass.

The Crocker-Wheeler Electric Company's belt type machinery is described in Bulletin No. 4. Address the main office, 39 Cortlandt street, N. Y., or any branch offices. Bulletin No. 3 gives full information about motor-dynamos, dynamoters and boosters. Sent free at request.

Armorite Interior Conduit is gaining in popularity every day in New York city. Mr. R. B. Corey, Havemeyer Building, who is general sales agent for Armorite in the metropolitan district, has closed contracts for a number of the office buildings now in course of erection.

Ball & Wood engines continue to reflect credit on their builders, the Ball & Wood Company, 120 Liberty street, New York city. Several improvements in detail have recently been added to these engines, which represent the highest there is in the art of engine building.

Interest in the next Electrical Exhibition is taking a very substantial shape. The demand for space is even larger than was looked for, and it comes from the leading representative firms in the electrical, steam and kindred trades. They are planning to spend money liberally in making their exhibits attractive. Madison Square Garden will afford plenty of scope for this sort of work, and present indications point to a remarkably brilliant display.

The Farr Telephone and Construction Supply Company, 342 Dearborn street, Chicago, is meeting with flattering success in the telephone business. The company is doing a larger business to-day than ever before, which speaks well for the reliability of the Farr company's products. The company desires to place in the hands of every telephone user a copy of its catalogue, which contains valuable information that every telephone user is desirous of obtaining. The catalogue will be sent to readers of the ELECTRICAL REVIEW free on request.

The Foxboro Foundry and Machine Company, of Foxboro, Mass., whose building was recently destroyed by fire, are to rebuild their plant in a substantial and fire-proof manner. The main foundry building, which is about 80 feet wide and 140 feet long, is being replaced by a steel frame structure. A traveling crane runway, for handling materials in the building, is being arranged for, and provisions are also being made for suitable jib cranes. The steel framework is being furnished and erected by the Berlin Iron Bridge Company, of East Berlin, Ct.

The Postal Telegraph Cable Company.

The undertaking of the Postal Telegraph Cable Company to establish a telegraph service along the coast in order to report steamship news, is stated to be the outcome of its bid for the hotel service of New York, says the *Wall Street Journal*. It seems that Western Union has heretofore held a monopoly in the hotels of New York. Western Union has claimed that it was giving the hotels too much money for the privileges it received. Accordingly the hotels invited Postal Telegraph company to compete for the business. One of Postal's drawbacks, so far, has been its inability to report the arrival of steamers for the benefit of the hotels. The hotels have much at stake in this news. Accordingly the Postal company has been bidding for this service, and succeeded a few days ago in securing the largest privilege in New York city, that of the new Waldorf-Astoria Hotel. The Postal company has also agreed to give the hotels a service equally good as that furnished by the Western Union. The Postal company in laying a cable from Coney Island to Sandy Hook secures the advantage of a sure connection in all kinds of weather. Western Union has frequent interruptions from storms. Postal is building three large towers at various points to sight the vessels. From Coney Island to Fire Island Postal will use the existing telephone wire through an amicable business arrangement with the telephone company.

American Society of Mechanical Engineers.

The annual meeting of the American Society of Mechanical Engineers, held last week in New York city, was a most successful and enjoyable gathering. Nearly 500 members and guests were present at the various sessions. The social features were of an entertaining character, and many valuable papers were read at the business meetings.

The annual election resulted in the selection of the following officers for the coming year: President, Charles Wallace Hunt, New York; vice-presidents, E. S. Cramp, Philadelphia; S. T. Wellman, Cleveland; W. F. Durfee, New York; John C. Kafer, New York; David R. Fraser, Chicago, and Walter S. Russel, Detroit; managers, Norman C. Stiles, Watertown, N. Y.; E. D. Meier, St. Louis; George W. Dickie, San Francisco; H. S. Haines, Atlanta, Ga.; Gus C. Henning, New York; A. Wells Robinson, Milwaukee; James B. Stanwood, Cincinnati; Henry H. Suplee, Philadelphia; George Richmond, New York; treasurer, William H. Wiley, New York.

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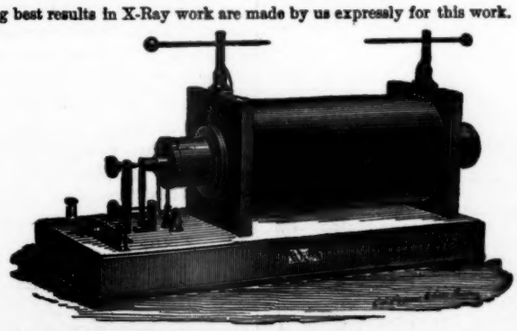

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Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED NOVEMBER 30, 1897.

594,379 Electric system of propulsion; W. M. Brown, Johnstown, Pa.—In an electrically propelled vehicle, a magnet carried thereby having energizing coils comprising two distinct sets of windings, one winding being in shunt with the motor carried by said vehicle, and the other winding being in series with said motors.

594,382 Signaling system; H. A. Chase, Boston, Mass.

594,386 Electric contact device and conductor construction therefor; J. W. Dortch, Johnstown, Pa.—An electric contact device, carried by the conductor having a plurality of supporting portions, and the cam-faces substantially in alinement with the conductor-hangers.

594,403 Overflow alarm; Chas. Johnson, Chicago, Ill.—In an overflow alarm, the combination of a frame, a vertical rod therein, two terminals of an electrical alarm circuit located adjacent to the rod, a boss sliding on the rod, an outwardly extending rod connected with the boss, and a ball at the free end of said named rod.

594,406 Traveling contact device for electric railways; M. D. Law, New York, N. Y.

594,407 Telephone line switch; Gilbert Lay, Licking, Mo.

594,426 Electric arc lamp; H. R. Quinby, Rochester, N. Y.—In an arc light the combination with the tubular armature having the removable lower end provided with a tapering recess of the collar operating in said recess, having the radial apertures, and balls in the apertures co-operating with the walls of said recess to clamp the carbon passing through the armature.

594,435 Combined gas and electric generator plant; S. H. Short, Cleveland, Ohio.

594,470 Electric switch; G. W. Hart, Hartford, Ct.—In combination with a rotary switch-plate, having a switch-spindle, a handle secured to the switch-spindle, a cover-plate adapted to inclose the switch-plate, and an index adjustably mounted with reference to the handle and on the cover-plate.

594,471 Electrically controlled block signal for railways; R. J. Hewett, St. Louis, Mo.

594,488 Poly-circuit dynamo; I. R. Prentiss, Cleveland, Ohio—A multipolar dynamo having separate independent circuits, each connected with two poles of opposite polarity.

594,489 Poly-circuit dynamo; I. R. Prentiss, Cleveland, Ohio—In a multipolar dynamo, a closed-coil armature having the brushes under each pair of field magnets of opposite polarity connected in series with an external circuit.

594,493 Electric brake; S. H. Short, Cleveland, Ohio.

594,511 Motor mechanism for horseless carriages; J. H. Auble, Lawrenceburg, Ind.

594,575 Electrically operated switch; W. D. Stanton, Springfield, Mass.

594,585 Electric arc lamp; T. E. Adams, Cleveland, Ohio—The combination with a lamp arm having a pin or projection thereon of a carbon guide constructed with a body portion adapted to permit the unobstructed passage of the carbon and terminating at one end in an arm adapted to engage the pin or projection on the lamp arm, an upward and inward projecting finger projecting from said body portion to engage the carbon.

594,614 Mechanism for making, breaking and switching electric circuits for railway signals; P. H. Forbes, Topeka, Kas.

594,618 Electric switch; M. Guett, Hartfort, Ct.

594,656 Electric switch; F. Schwedtmann, St. Louis, Mo.—In an electric switch, a pivot post, a switch-blade carried thereby, a contact post, a plurality of contact springs at each side of contact post and carried thereby, the springs of each set being divided into a number of parts and the division arranged out of register.

594,665 Electric brake; W. Weihlman, New York, N. Y.

594,677 Electric burglar alarm; T. A. Clarke, Bootle, England.

594,682 Electric arc light; T. E. Drohan, Chicago, Ill.—In an electric arc light, the combination with a tubular part through which the carbon is adapted to be fed, of a trigger adapted to rest on the carbon as it is fed through said passage and to engage with said tubular part after the carbon has passed the trigger.

594,687 Commutator; G. J. Greiner, St. Louis, Mo.

594,700 Electric pleasure railway, L. Lilley, Cincinnati, Ohio.

594,702 Electric railway; R. Lundell, Brooklyn, N. Y.—In an electric railway system, three sets of surface contacts, one set being connected to the positive or plus current main, the second to the negative or minus main or return, and the third set connected to the track rails through switching electro magnets.

594,744 Means for controlling electric currents; P. Kennedy, Brooklyn, N. Y.

594,745 Pole-changing mechanism for electric generators; P. Kennedy, Brooklyn, N. Y.

594,779 Regulating electric motors; A. G. Davis, Washington, D. C.—Consists of a plurality of motors coupled in tandem, with phase-advancing devices adapted to neutralize, in whole or in part, the self-induction of the intermediate circuits.

594,790 Lantern; W. S. Hamm, Chicago, Ill.—Consists of a cap, a removable wind cone adapted to move vertically therein, and a spring-actuated pin arranged to enter a suitably disposed opening in the cap and the wind cone.

594,800 Electric rail-bond; S. W. Huff, Baltimore, Md.—Consists of a flat-metal body portion composed of a number of parts which render it flexible edgewise, and attaching lugs integral with the ends of said body portion and formed of the same metal as said body portion.

The American Graphophone Wins Its Suit.

On November 30 Judge Grosscup, in the United States Circuit Court at Chicago, issued an injunction in favor of the American Graphophone Company, restraining David E. Boswell from making, using or selling any sound record or recording tablets. A year ago Boswell was president of the National Ediphone Company, and it was alleged in a suit brought then that the ediphone was an infringement on the patents under which the graphophones were made. The court at that time issued a permanent injunction restraining Boswell from continuing the manufacture of the ediphone, but soon after, it is alleged, the company learned that Boswell was engaged in the manufacture of cones, or records, at the rate of 6,000 a day. Another bill for an injunction was filed on the ground that Boswell's records were also an infringement of patents.

The defendant assumed to attack the novelty of the sound record on the Edison tin-foil record and on the general ground that there had been no adjudication of the American Graphophone Company's claims. Whereupon Judge Grosscup took the matter up and gave a lecture on what constituted patentable invention, and said that if the sound record was not a patentable invention there never was one; that he had carefully considered this same matter on a previous occasion and reached the conclusion that the American Graphophone Company was the first to produce any sort of a record that was practical, or available for any use.

GENERAL NOTES.

An electric light plant has been put in St. Francis Xavier College, at Halifax, Nova Scotia. The necessary steps to light the town of Antigonish are being taken.

The proposed Lisbon–East Liverpool electric line, which will connect the Erie lines with the Ohio River, at East Liverpool, Ohio, is to carry freight. Right of way is all secured, and negotiations are on for the purchase of land for terminal facilities just outside the city.

At the annual meeting of the stockholders of the Edwardsville, Ill., Electric Light and Power Company, C. A. Vallette, F. Girt, Henry Wiebusch, C. H. Fischer and W. M. Wetteran, all of St. Louis, were elected directors for the ensuing year, and it was decided to increase the capital stock of the company from $20,000 to $30,000.

At the stockholders' meeting of the Pawcatuck Valley, Ct., Street Railway Company, the following officers for the ensuing year were elected: President, William Hoxsey; general manager, E. P. Shaw, Jr.; secretary and treasurer, Samuel H. Cross. The old board of directors was re-elected, except that Dr. John Champlin was chosen to succeed Hon. Nathan F. Dixon, deceased.

TRADE NOTE.

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